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POPULAR MECHANICS

MAGAZINE

WRITTEN SO

YOU CAN UNDERSTAND IT

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SECTION**



IF I FAILED...WE WERE ALL DEAD MEN



LASHED TO SHROUDS
OF SINKING,
BURNING SCHOONER,
SAILORS SEE HOPE
OF RESCUE FADE

① "The dream of my life, for which I had saved since I first went to sea at twelve, had come true!" writes Capt. Hans Milton of 610 West 111th St., New York City. "I was making my first voyage as master and owner of my own vessel, the two-masted topsail schooner 'Pioneer,' when the hurricane of last September caught us 400 miles off Nantucket.



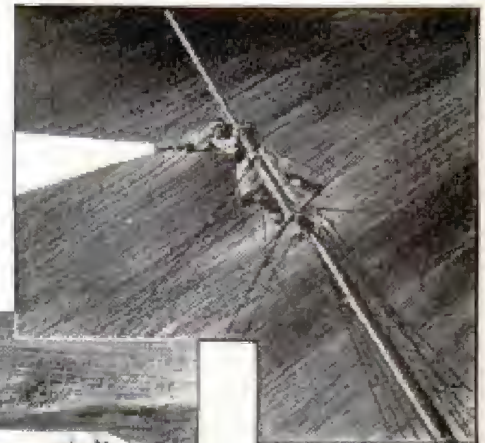
② "We were pumping to keep afloat when we passed into the windless vortex of the storm where the waves were leaping and jumping crazily and where they crashed in our companion ways and filled the ship beyond hope of saving her.

The five of us and the cat scrambled aloft for our lives. Our deck-load of lumber kept us afloat and without fresh water and with almost no food we lived, lashed to the rigging, for three endless days and nights.

③ "Once a steamer hove in sight—but failing to see our distress signals, went her way. At 3 a.m. on the fourth morning steamer lights showed momentarily over the wild sea. We rigged a huge ball of sails and blankets, soaked it with gasoline, touched it off and hoisted it aloft.



④ "But the steamer did not change her course. She thought we were fishing. The wind blew burning fragments back on the ship setting her afire in various places. I could see the stern light of the steamer going away from us. *If I couldn't stop her, we were all dead men!* I climbed to the fore-top and in desperation pulled my flashlight from my back pocket and in Morse code signalled 'Sinking... S O S... Help!'



⑤ "Slowly, I saw the ship turn! In her last hour afloat, all of us and the cat were saved from the sinking, burning 'Pioneer' by those fine seamen of the United States Liner 'American Banker' and by the power of two tiny 'Eveready' fresh DATED batteries that stood by us in the blackest hour of our lives!

(Signed) *Captain Hans Milton*

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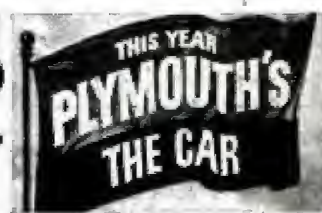
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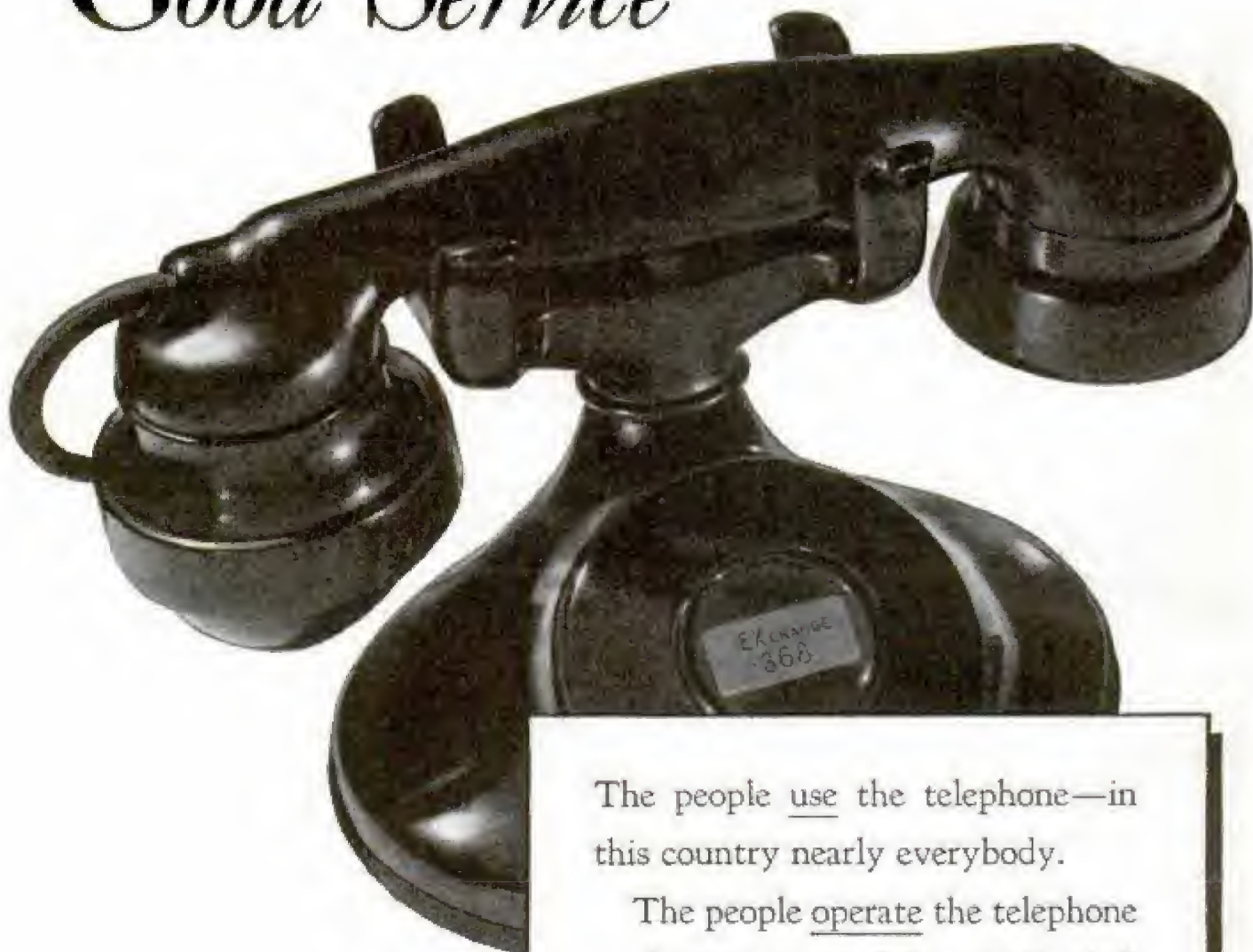
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February, 1939

Vol. 71, No. 2

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Going Nature One Better

SEED catalogues could tell amazing stories of plant wizards who produce big-eared corn from pygmy parents, who rob the marigold of its rancid odor and give it a chance for popularity, who tour the world in quest of a sweet pea that can keep its chin up through a hot midwestern summer. Seed men have learned new ways of tricking nature into producing lovelier flowers and tastier, blight-resistant fruits and vegetables. "Shock treatments" create new varieties by forcing a change in the chromosome balance; seeds are treated with X-rays, heated to the point of cooking and then quickly cooled. Small plants are drugged with an extract from the autumn-blooming crocus to shock them into new life forms. An article in the March issue will tell you how seed scientists on safari and in the laboratory are "Going Nature One Better."

Next Month

SHOOTING a Technicolor movie is not just a matter of pointing a big camera and filming what color is there. Hollywood has to choose its colors first to create the right mood—pastels, hydrangea blues, daffodil yellows for the gay musical play or romance; sepia, maroon, olive for the serious dramas, bold colors for exciting high spots. An article next month, with eight pages of Coloroto photographs, tells how color pictures are made.

Cattle Rustlers of '39

RUSTLERS were getting away with calves and leaving no clue—not even a tireprint or footprint. It was all very baffling until detectives raided a suspect's camp and found a man's shoe with a wooden plate on the sole carved in the shape of a cow's hoof. Cattle rustlers still do a million-dollar business, but they still get caught, as you will find in a story in the March issue.

"Hot Papa"

LANDING gear snarled, an army plane tumbles across the runway in flames, trapping the pilot in the cockpit. But the airport control tower was looking for trouble and "Hot Papa" is right there wading through the fire in his asbestos overalls. Follow the thrills of the airport crash wagon in "Hot Papa to the Rescue," appearing in the next issue.



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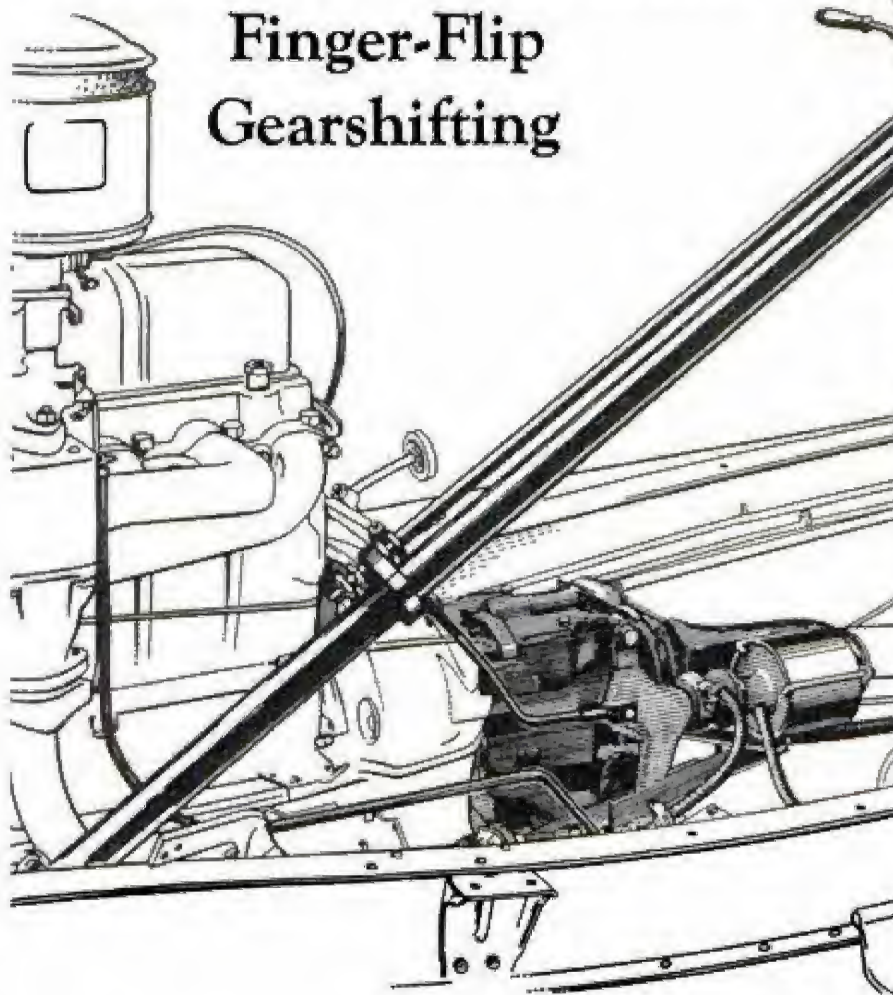
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Vacuum Booster Creates Finger-Flip Gearshifting



Gears are shifted by a piston within the vacuum cylinder, mounted at the rear of the transmission. The short shifting-lever at the steering wheel controls the travel of the piston. Shafts and rigid links, instead of flexible cables, transmit movements of the shift lever to the vacuum control valve.



A steering-column gearshift that uses the power of a vacuum cylinder to shift the transmission gears is one of the outstanding motor car improvements for 1939 introduced by Chevrolet, and available on all models at slight extra cost.

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vacuum cylinder controls the shifting mechanism. The action is so exact that the driver is always in complete control of the shift; in fact, he can "feel" each stage of a shift, as with the floor-board lever.

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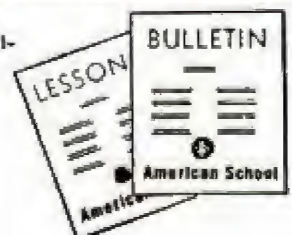
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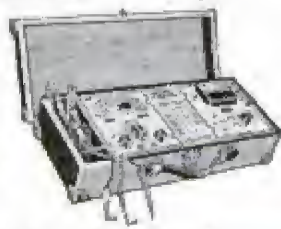


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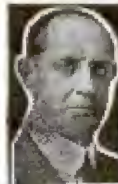
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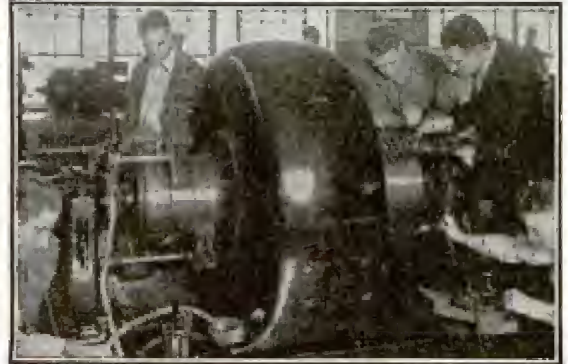
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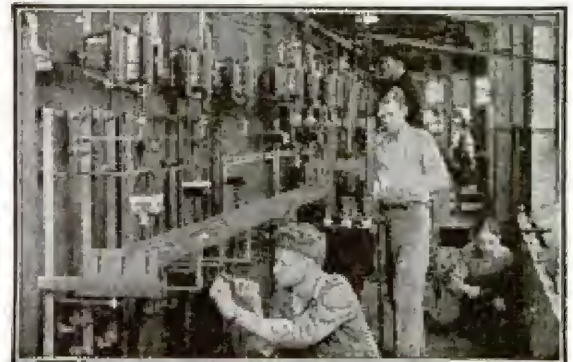
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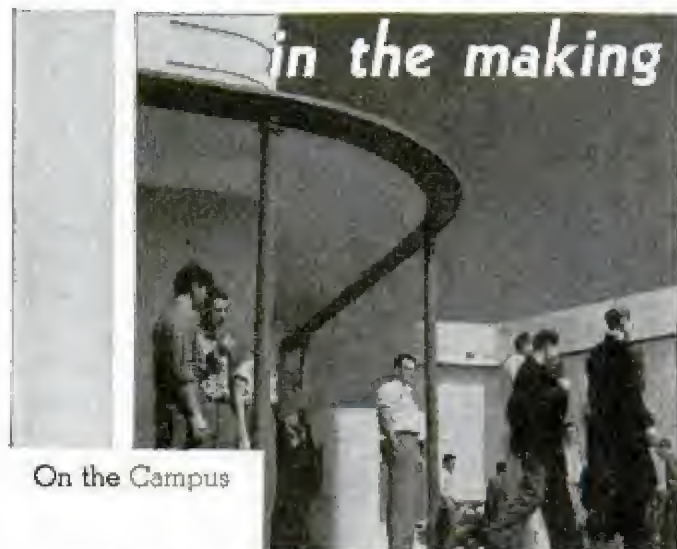
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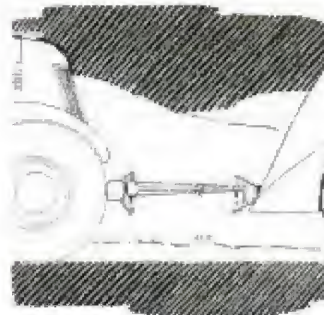
he picks it up by an attachment on the plane. Then he climbs again into the upper air to repeat the performance.

PROTECTION of banks and theaters from holdups is the purpose of a newly patented alarm. It consists of a body-girdling belt that fits around the chest of a guard or other employe and it includes an oscillation generating device adapted to transmit signals strong enough to be picked up by a receiving apparatus in another part of the bank or other building. The generator is actuated when the wearer of the alarm belt expands his chest abnormally, that is, more than that necessary in ordinary breathing.



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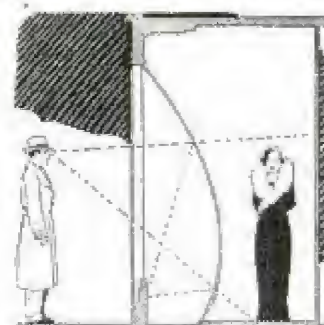
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(Continued to page 33A)

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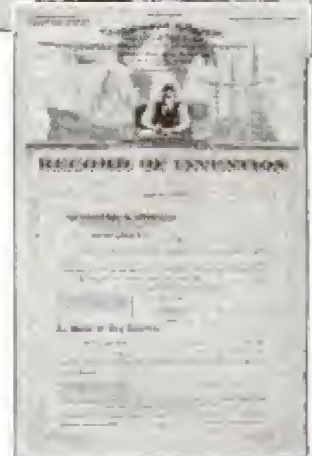
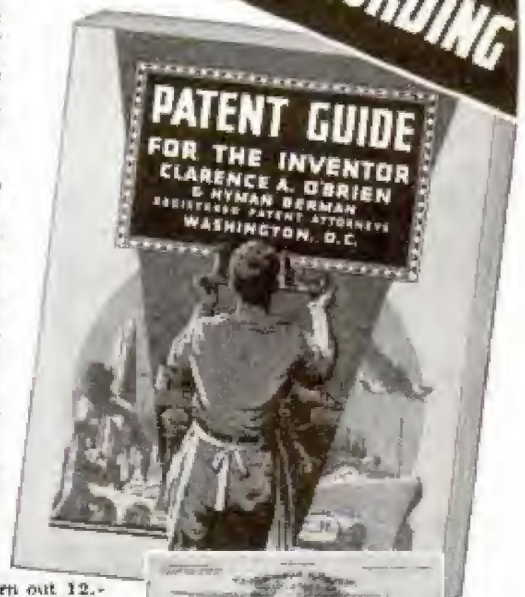
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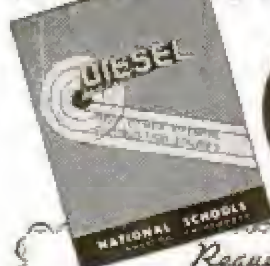
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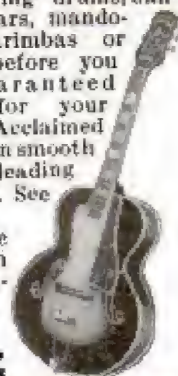
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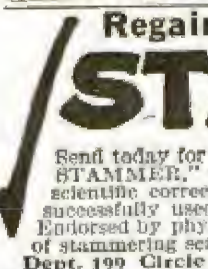
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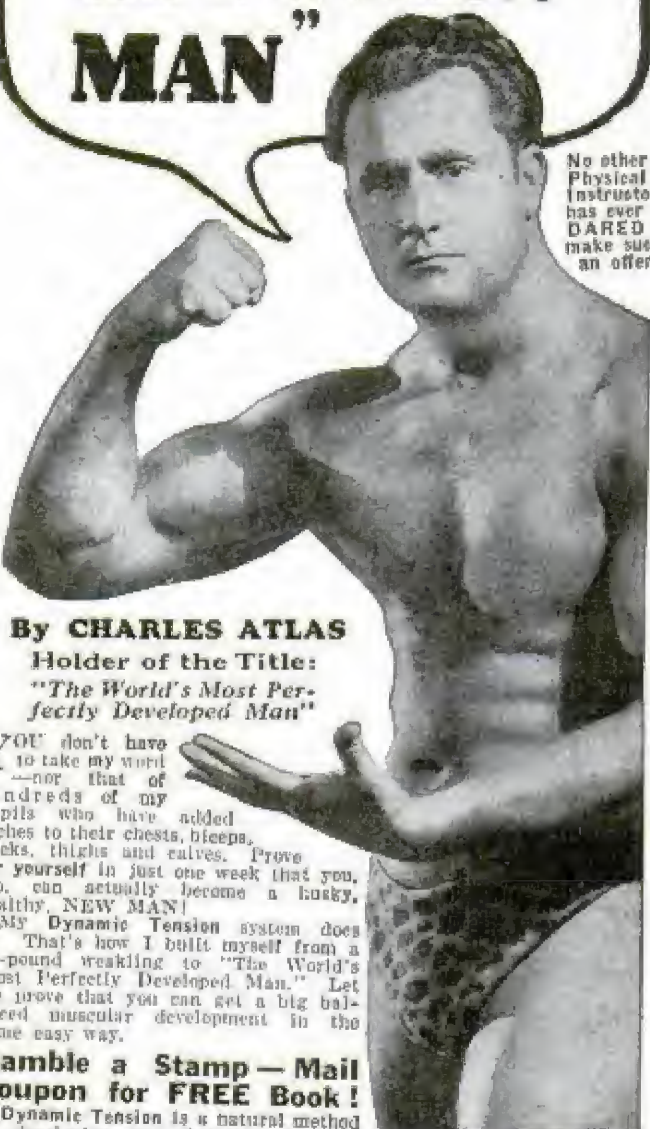
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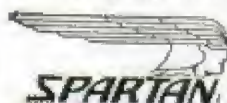
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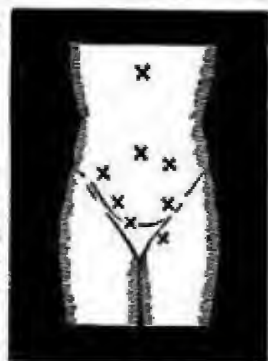
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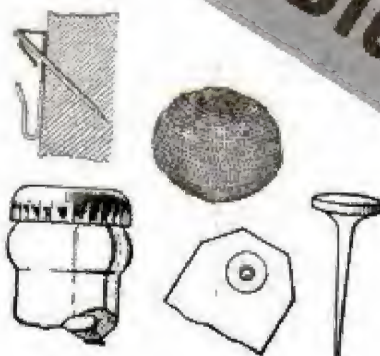
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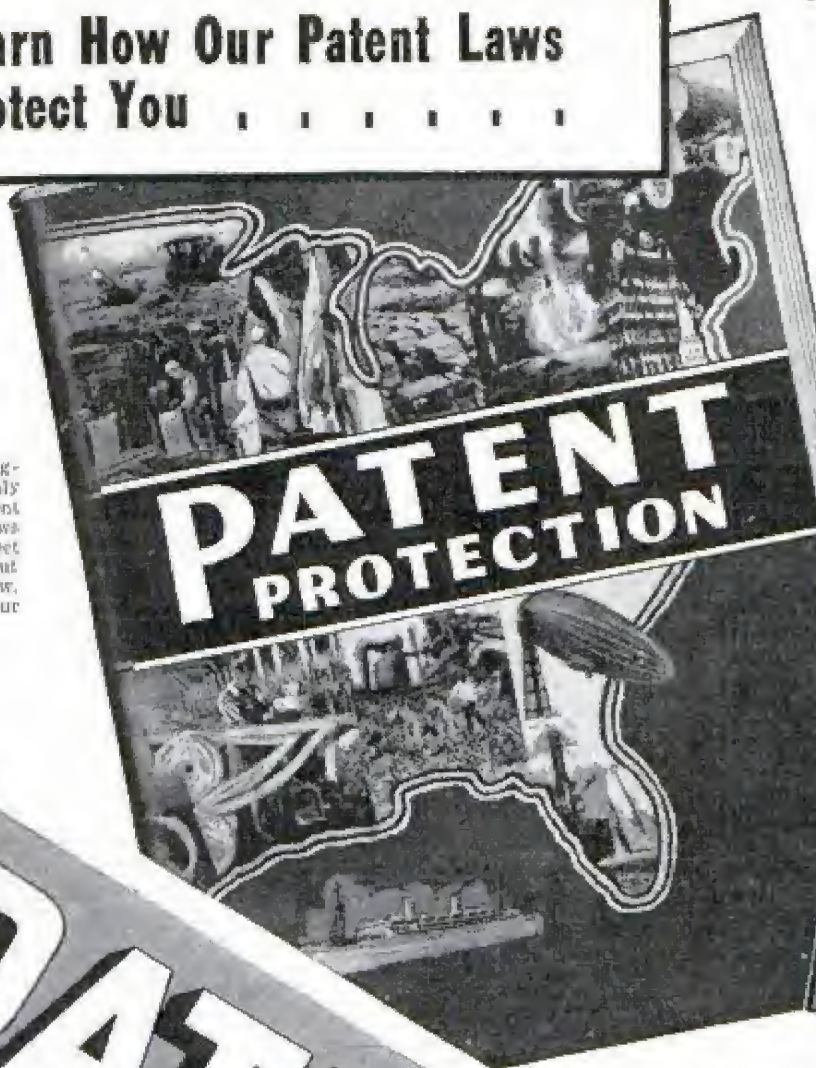
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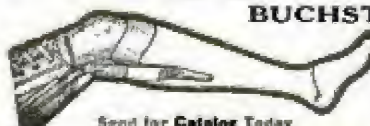
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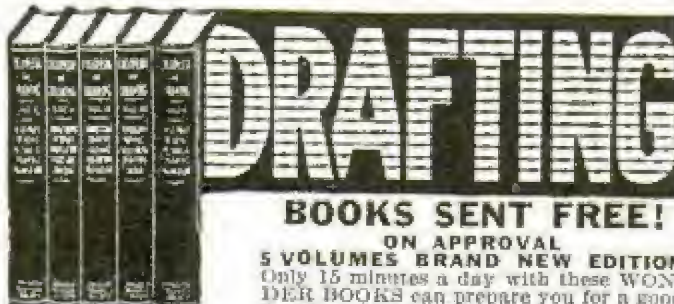
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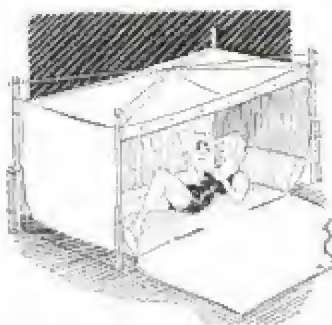
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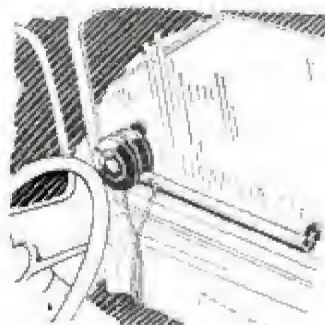
(Continued from page 20A)

BEACH outings next summer might be more pleasurable if a newly patented shelter were on the market. The shelter is made of fabric, supported at four corners by stakes in the manner of a tent. It has a roof to protect the user against sunburn.

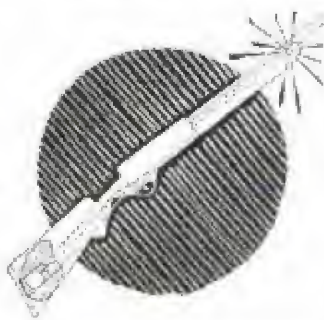


Ordinarily the shelter would be erected with three sides in place, the fourth open toward the water, but this fourth side may be raised to permit changing from clothing to bathing suit in privacy. The shelter is easily portable.

EASILY attachable to the windshield, a small defrosting unit for the automobile has been patented. It consists of a small housing containing a motor, which drives a compressor. Extending from the housing along the lower edge of the windshield, in front of the driver, is a small metal cylinder with openings toward the windshield. Through these openings air is forced by the compressor, thus keeping the glass clear of frost in cold weather.



INCREASED safety for the hunter is provided by an illuminated indicator that



shows when the gun is ready for firing. The device consists of a light bulb set into the wood on which the barrel rests and a battery located in the gunstock. An electrical circuit is arranged so that when the gun is ready for firing, the circuit is closed and the bulb lights to warn the hunter. A small switch controls the circuit.

(Continued to page 51A)

"I aint"

"He don't"

"It's me!"

"You was?"

"Can't hardly"



What Are YOUR Mistakes in English?

They may offend others as much as these offend you

IF some one you met for the first time made the mistakes in English shown above, what would you think of him? Would he inspire your respect? Would you be inclined to make a friend of him? Would you care to introduce him to others as a close friend of yours?

These errors are easy for you to see. Perhaps, however, you make other mistakes which offend other people as much as these would offend you. How do you know that you do not mispronounce certain words? Are you always sure that the things you say and write are grammatically correct? To you they may seem correct, but others may know they are wrong.

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FREE Instructions. Build powerful telescope. Jamer, Box 94, Manerville, N. Y.

USED Microscopes, binoculars, astronomical telescopes, surveying instruments—bought, sold, repaired. Send 10c for list. Rasmussen, P. O. Box 294, Amsterdam, N. Y.

MICROTOME, \$3.00 Postpaid. Satisfaction guaranteed. Circular. Malcolm Goodwin, 1422 Rorer, Roanoke, Va.

SPORTING GOODS, GUNS, FISHING TACKLE, ARCHERY

BARGAINS! Gun catalog 5c. Fishing catalog 5c. Ski catalog 5c. J. Warshaw & Sons, First and Madison-PM, Seattle, Wash.

FENCING Equipment. Foils, swords, masks, etc. Low prices. Free catalog. Industrial Products, Dept. 23, 48 West 48th Street, New York.

RIFLES, Shotguns, S&W, Colts, target pistols, air rifles, hunting knives, binoculars, telescopes, police goods, badges, holsters, etc. Bargain catalog 3c. Lee Sales, (Dept. W), 35 West 32nd St., New York.

GOLF Clubs. Five club matched set \$2.50. Lincoln Surplus, 123 Galena, Freeport, Ill.

TREASURE Finders? Read Goldak advertisement on page 133A.

LEARN Gunsmithing at home. Repair your own and neighborhood's firearms. Free catalog describing 20 books on firearms and gunsmithing. Samworth, Marines, North Carolina.

SINKER Molds for making your own sinkers. Free illustrated folder. Reading Instrument Co., Box 78, Reading, Penna.

ARCHERY Headquarters—617 South State, Chicago. Catalogue free. Complete instruction book 50c.

HUDSON Bay blankets, Indian pack baskets, camp stoves, knives, compasses, outdoor equipment. Free catalog. Howe Fur Co., Box P, Coopers Mills, Maine.

ANTIQUES, RELICS, INDIAN GOODS

SWORDS, Rapiers, daggers, armor list. Send stamp. Abels, 860A Lexington Ave., New York.

DOLLS, Antique, bought for cash. Write Kimport Dolls, Independence, Mo.

100 GOOD Or 50 fine arrowheads, \$3.00. George Holder, Glenwood, Ark.

MAKE Your own Indian arrowheads. Illustrated booklet "How to Make Arrowheads" of flint, glass, etc., \$1.00. Indian Lore Publications, Green River, Wyoming.

100 GOOD Arrowheads \$3. Catalog. 5c. H. Daniel, Hot Springs, Ark.

INDIAN Relics, beadwork, coins, curios, minerals, old glass. Catalog 6c. Indian Museum, Northbranch, Kansas.

TAXIDERMY

PRICES Slashed! New 36-page 1939 supply catalogue free. New items. New ideas. Postcard brings yours. Taxidermic Manufacturers, Memphis, Tenn.

LEARN By mail to mount birds and animals, tan skins, make leather. Old reliable school teaches, easily, quickly, at low cost. Over 250,000 students. Rush postal for free 48 page book. Northwestern School of Taxidermy, 775 Elwood Bldg., Omaha, Nebr.

GLASS Eyes, taxidermists', furriers' supplies. Big catalog free. Elwood Company, 222 Smith Bldg., Omaha, Nebr.

TAXIDERMY Supplies—Quality artificial eyes, teeth, genuine Jonas head forms. Tools, materials, etc. Everything for the progressive taxidermist. Send 10c for big illustrated catalogue. Jonas Bros., 1049 Broadway, Denver, Colo.

DOGS, PETS, BIRDS

\$15.00 BUYS Trained coon hound. Opossum, fox, rabbit and bird dogs cheap. List free. Ramsey Farm Kennels, Ramsey, Ill.

MAMMOTH Great Danes. Marvelous guards, companions. Pups \$25.00. Write for pictures. Kaimar Danery, Stone Mountain, Ga.

BIG Profits breeding Boston! Circulars, dime. "Sentree," Royal Oak, Michigan.

BIRDS? Get American Canary Magazine monthly. Year \$1.00. 2839-P North Halsted, Chicago.

BEAUTIFUL Pure white police dogs. Ansonia Kennels, Mose, N. Dak.

SPORTSMEN: 200 Pointers, setters, straight cooners, combination hunters, rabbit and fox hounds. Reasonable. List free. Ramsey Creek Kennels, Ramsey, Illinois.

REAL St. Bernard puppies—cheap too! Royal Kennels, Chazy, N. Y.

POULTRY AND FARM SUPPLIES

SEXED And sex-linked chicks. 6 popular hybrids; 52 purebreds. Large new book free. Mrs. Berry's Farm, Route A, Clarinda, Iowa.

MORE Profit in your grain fed to broilers. Poultry prospects bright. Write today for catalog, early order and quantity discounts. Dubois County Hatchery, Box 912, Huntingburg, Indiana.

LOW Factory prices on electric brooders, batteries, parts, wire fabrics, etc. Free 76 page catalog. Bussey, 5151 West 65th, Chicago.

HEADQUARTERS—World champion layers. We imported 353 - 361 - 364 egg contest hens from Australia - New Zealand. Free educational catalog shows customers profits. Osborne Farm, Box 76, Holland, Michigan.

10 CASH Prizes weekly for ten weeks. Also in addition to cash prizes, 5 all-expense trips to World's Poultry Congress. Write for contest rules and free catalog telling how to make money with Davis chicks, 21 breeds. Sexed chicks \$4.50—100 and up. Davis Poultry Farm, Route 34, Ramsey, Indiana.

MAKE Money with poultry. Read America's leading poultry magazine for latest information. Three years \$1.00; nine months 25c. Poultry Tribune, Dept. E-93, Mount Morris, Ill.

GREENSBURG Bloodtested chicks for broilers. Immediate delivery on Barred, White, Buff Rocks, Reds, also Leghorns \$4.50 up. Write for catalog, early order and quantity discounts. Greensburg Hatchery, Box 40, Greensburg, Indiana.

CHICKS For broilers. Immediate delivery on Reds, Barred, Buff, White Rocks, Wyandottes, Orpingtons, Leghorns. Sexed chicks 90% accuracy guaranteed on pullets. Write for low prices, quantity and advance order discounts. Salem Hatchery, Box 81, Salem, Indiana.

SEYMOUR Chicks for broilers and early layers. Our prices are always at rock bottom. Write us before you buy chicks. Get our free catalog, early order and quantity discounts. Seymour Hatchery, Box 36, Seymour, Indiana.

CHICK Raisers make extra money selling our chicks to neighbors. Write Jackson County Hatchery, Box 19, Seymour, Ind.

TREES, SHRUBS, ROOTS, HERBS

JUST Out! World's greatest "Herballist Almanac." Beautifully illustrated in natural colors. Contains over 200 old-fashioned herb medicine recipes for home use. 10c postpaid. Worth dollars! Botanicals, 145 W. 112th St., Chicago.

FARMS AND FARM LANDS

FARMS That pay in the Great Northern Railway agricultural empire, Minnesota, North Dakota, Montana, Idaho, Washington, Oregon. Fertile black soil, high production crops, grain, fruit, vegetables, feed and livestock. Many kinds of farms for selection. Write for book on state you prefer. E. C. Leedy, Dept. 257, G. N. Ry., St. Paul, Minn.

JUST Out! Strouts catalog—Farms, country homes, rural business opportunities; nearly 2000 bargains described in states east of the Mississippi; write today for this money-saving time-saving guide. Free. Strout Realty, 255-P 4th Ave., New York City.

GOVERNMENT Lands ten cents acre up. Information all states twenty-five cents. National Tax Service, 600A Majestic Bldg., Detroit, Mich.

CALIFORNIA Irrigated dairy farms. Almond or walnut groves, fruit orchards and cattle ranches. For full particulars, write Bomberger Bros., Modesto, Calif.

GOOD Farms available. Washington, Minnesota, Idaho, western Montana, Oregon. Dependable crops, favorable climate. Write for impartial advice, literature and list of typical bargains. Specify state. J. W. Haw, 119 Northern Pacific Ry., St. Paul, Minn.

40 ACRES, Near White River, unimproved; poultry land. \$175, \$5 down, \$5 monthly. Free list and literature. Hubbard, 216 Grossman Bldg., Kansas City, Kans.

CANADIAN Tax sale lands for a dollar an acre and up. Small monthly payments. Farms, timber, hunting and fishing camps, minerals. Limited number of properties. Write at once for free illustrated booklet. Tax Sale Service, Room 613, 62 Queen St. W., Toronto, Canada.

FARM MACHINERY AND SUPPLIES

ALL Purpose tractors at factory price. Shaw 2 to 5 horsepower, riding or walking types. Does plowing, discing, harrowing, cultivating; mows lawns, cuts weeds, does hauling; runs belt machinery. Air or steel tires. Three speeds forward and reverse. Thousands in use. Write for free catalog and 10 day trial offer. Shaw Mfg. Co., Dept. PM2, Galesburg, Kansas.

NEW And used tractor parts at tremendous savings. Write for free 1939 catalog. Central Tractor Wrecking Co., Boone, Iowa.

PROFITABLE OCCUPATIONS

RAISE Rabbits and cavies for us. We buy at top prices. Complete details in catalog, contract and magazine. 10 cents. Stahl, Box 1, Holmes Park, Mo.

REGROOVING Smooth tires is profitable. Your own business. Write today. L-219 N. 63rd Street, Philadelphia.

MEN—Women, operate "Specialty Candy Factory" home, all or spare time. We furnish outfits and instruction. Opportunity to earn steady income. (Our 29th year.) Booklet free. W. Hilber Ragsdale, Inc., Drawer 62, East Orange, N. J.

M. M. earned \$267, three weeks, raising mushrooms in cellar! Exceptional, but your cellar, shed perhaps suitable. We buy crops. Book free. United, 3848 Lincoln Ave., Dept. 59, Chicago.

BIG Money raising Angora Wool rabbits! Easy, fascinating. Wool brings \$3 to \$6 lb. Catalogue wool samples 10c. Clay's Farm, Sharon, Wash.

BALLGAMES, Movies afternoons. Work mornings home. Your own business. Stamford, 3702-A Broadway, New York.

MINK, Bred females, April delivery. Dime for general information. Lomman's Fur Farm, Spangler, Penna.

COUNTRY Drives or movies afternoons! Work mornings home. No canvassing! Folio-H, Station D, Los Angeles.

TREASURE Finders? Read Goldak advertisement on page 133A.

RAISE Guinea pigs, make money. Thousands needed. We supply breeders and buy the young. Free illustrated book. Research Supply, 2436 W. York Street, Philadelphia, Penna.

POSITIONS At sea. Details free. No employment agency. Julius, Amarillo, Texas.

MAKE Door mats from junk tires with ordinary home workshop equipment. Complete instructions \$3.00. Thomas Kowell, 5372 St. Clair, Detroit, Michigan.

MINK Easily raised. Highly profitable. Free booklet. Banks Minks, Framingham, Mass.

OLD BOOKS WANTED

WE Pay up to \$5000 each for old books, also high cash prices for old magazines, letters, newspapers. A single story book, school book, old Bible, travel book, almanac, etc., that looks worthless may bring you \$50, \$100 or \$500 in cash. Thousands wanted. Send 10c now for latest price list. American Book Mart, 140 S. Dearborn, Dept. 2513, Chicago.

BOOKS, PERIODICALS, PICTURES, POSTCARDS

SEND 10c For trial subscription. American Freeman, questions and answers magazine. Haldeman-Julius, Girard, Kansas.

EXCLUSIVE N. Y. world's fair photos. Information, samples 10c. Forman, 882 Lorimer, Brooklyn, N. Y.

SPARE-TIME Subscription representatives for all magazines. Instructions, complete starting supplies; free. Pines, 583-A Monroe, Brooklyn, N. Y.

YOUR Favorite magazines—Half price. Catalog, 10c. Magazine Exchange, Baseline, San Bernardino, Calif.

GAMES—ENTERTAINMENT

BINGO Games, all sizes, lowest price catalog. Warnovec, Conimicut, R. I.

PLAYS, Operettas, musical comedies, complete minstrel first-parts with song programs, blackface skits, vaudeville acts, monologs, dialogs, recitations, juvenile plays and songs, musical readings, entertainments, make-up goods. Catalog free. T. S. Denison & Co., 203 N. Wabash, Dept. 11, Chicago.

MAGIC TRICKS, PUZZLES, JOKER NOVELTIES

MYSTIFYING Tricks, 11c each! Get yours. 1908 Commercial, Waterloo, Iowa.

LEARN Ventriloquism, 3c stamp brings particulars. Smith, 125 N. Jefferson, Peoria, Illinois.

LOOK! New 1939 catalog professional stage magic only 10c. Big new catalog 500 pocket-parlor tricks 10c. Each different—get both. Lyle Douglas, Station A-5, Dallas, Texas.

EARN Money in any crowd. Call names of strangers, tell unspoken questions. Professional course mind reading, spirit writing, etc., \$1. Henderson, Box 341, San Bernardino, Calif.

GIANT Surprise catalog of jokes, tricks, magic, puzzles, novelties, curiosities rushed for 25c. Free mystery trick included. Lawson Vick Co., Dept. P4, Queens Village, N. Y.

MAGIC, Earn while learning. Particulars for stamp. Browne, Box 272, Duluth, Minn.

HAVE Fun! Fool your friends! Latest trick jokes. 10c brings illustrated catalog and snappy free trick! Broadway Novelty Co., Box 75, Pelham, New York.

BE A magician. Large professional magic catalogue of latest tricks 25c. Cash paid for complete Tarbell Magic Courses. Write, Ireland, C-109 North Dearborn, Chicago.

THE Lyle Douglas catalogs are bigger and better than ever. Lyle Douglas, Station A-5, Dallas, Texas.

MAGIC! Books, occult; novelties. Catalog 10c. Eastern City Sales, 8-E Randolph, Chicago.

SVENGALI Magic decks. Bridge size, new style. Demonstrators sell them for one dollar. Dozen \$3.25. Sample postpaid thirty-five cents. Catalog 300 jokes and magic free. Adams Company, Asbury Park, N. J.

WORLD'S Largest magic shop professional catalog, 25c. Holden, 220 W. 42nd St., New York.

BECOME A magician and earn extra money in your spare time. Send 25c today for your copy of our 168 page catalogue. This book is full of tricks for everyone, from the beginner to the professional performer. Established 1910. Chicago Magic Company, 2300 North Mason Avenue, Chicago, Illinois.

RARE COINS

ANCIENT Roman coins. Five different, \$2.00; commemorative half dollars, five different, \$5.00. S. Koeppl, Merritt Bldg., Los Angeles, California.

UNITED States. Large cent, 2c bronze, 3c nickel and bargain list, 25c. Eleven dates large cents, \$1. George P. Coffin Co., Augusta, Maine.

GENUINE Roman coin 25c; Flying Eagle, 3c nickel and list 25c. Maurice Gould, Box 73, Brighton, Mass.

COINS Bought: Will pay \$5.00 each for certain Lincoln pennies; Indian heads \$100.00; dimes \$500.00. Catalogue 10c. Federal Coin Exchange, 40 S-Mill, Columbus, Ohio.

COIN Cards, large stiff cardboard 11x14 in., cutout for Indian or Lincoln cents, liberty or buffalo nickels. Each 50c postpaid. Foreign postage extra. Lohmer Co., 825 Lima, Burbank, Calif.

OLD Money wanted. Do you know that coin collectors pay up to \$100.00 for certain U. S. cents? And high premiums for all rare coins? We buy all kinds. Send 4c for large coin folder. May mean much profit to you. Numismatic Co., Dept. 20, Fort Worth, Texas.

COMMEMORATIVE Half dollars. Lincoln \$1.19; Cleveland \$1.19; Long Island \$1.19; Texas \$1.19; Boone \$1.29; Arkansas \$1.89; Elgin \$1.49; Wisconsin \$1.49; York \$1.49; Bridgeport \$1.99. Selling price list free. Bob Cohen, Box 3597-G, Cleveland, Ohio.

44 COINS. Bills, tokens, 25c. Otto Oddehon, Overland Station, St. Louis, Mo.

PREMIUMS Paid for 1200 different U. S. coins in circulated condition including Indian and Lincoln pennies, standing Liberty quarters, etc. Complete buying list 15c. James Randall, 407 South Dearborn Street, Chicago.

INDIAN Cents. 10 different, 25c; 40 coins, bills, tokens, 25c; 20 coins, 25c. Bischoff, 500 E. 8th, Kansas City, Mo.

UNCIRCULATED San Francisco mint cent and list 10c. 3 different 25c. Landon, Box 1733, Wilshire Station, Los Angeles.

BIG Prices paid for certain wanted coins. 1909 cent \$10.00, some silver dollars \$4000, 1864-1865 Indian head cents \$100.00 each, dimes before 1895, \$500; liberty head nickels before 1914, \$500; encased postage stamps; some large pennies \$2000; half cents, \$275.00; paper money, gold dollars \$1500, foreign coins \$165, some worth \$6000 each. You may have coins for which we pay big premiums. Therefore send 15c today for 1939 big illustrated coin book for certain wanted coins. National Coin Corporation (30), Daytona Beach, Florida.

GET Profit and pleasure in collecting old coins. Send 10c for 56-page illustrated coin catalog. You'll be delighted with it. Send for it now. B. Max Mehl, 370 Mehl Bldg., Fort Worth, Texas. Largest rare coin establishment in U. S. Established 38 years.

FINE Foreign 1700 coin, 2 notes and catalog 10c. Geo. Best, Cedar Rapids, Iowa.

COMMEMORATIVE Half dollars. Lincoln, Stone Mountain, Oregon, Texas, Cleveland, Kentucky, San Diego, Long Island, \$1.50 each. Illustrated catalogue No. 14, 25c. Norman Shultz, Salt Lake, Utah.

FREE! Foreign coin, banknote, and large illustrated coin catalogue. Send 4c postage. Coin approvals sent. Tatham Coinco, Springfield-125, Mass.

\$5 TO \$500 Each paid for hundreds of old or odd coins. Keep all until posted. Many very valuable. Send 10 cents for illustrated Coin Value Book, 4x6. Guaranteed buying and selling prices. 31 years in business. Coin Exchange, Box 5, Le Roy, N. Y.

RARE U. S., foreign coins, war medals. Catalogue 10c. Mengelle, Colorado Springs, Colo.

OLD STAMPS WANTED

WILL Pay \$100.00 for 1924 1c green Franklin stamp, rotary perforated eleven (\$1,000.00 if unused). Send 6c today for large illustrated folder showing amazing prices paid. Vernon Baker, 444PM-1, Elyria, Ohio.

BUYING List with 333 illustrations, 10c. Liberty Stamp Co., St. Louis.

STAMP COLLECTING

BRITISH Solomon Islands—Land of cannibals and head hunters! Immense Solomon Islands commemorative, \$5. United States, Liberian Bongo antelope, mystery British Colony triangle (a thrilling surprise!), fantastic Manchukuo mausoleum, breathtaking beauty from Cayman Islands, etc. This astounding packet of bizarre and intriguing stamps absolutely free to approval applicants enclosing 3c postage. Viking Stamp Company, 1-Z Hanson Place, Brooklyn, N. Y.

WHOLESALE — Canada, Newfoundland. Fifty page illustrated wholesale catalogue, featuring Canadians, Newfoundland, British Colonials, United States, supplies. Free. Empire Stamp Company, Dept. 5, Toronto, Canada.

81 DIFFERENT Including Costa Rica triangles, Egyptian airmail; set Kouang Tchou; 25 British Colonies, etc. All for 10c with approvals. Arden Page, Hornell, New York.

MAMMOTH Free packet. Savage princess, exotic scenes, weird natives, maps, boats, animals, 3c postage. Approvals. Smith, 693 Clifford, Rochester, N. Y.

GIANT Packet 200 all different, from Africa, South America, Asia, South Sea Islands, etc. Includes world's smallest stamp, triangle and diamond-shaped stamps, animal stamps, Nicaragua Olympic "baseball" commemorative; and many others. Also packet 17 different United States (cat. 65c)—all obsolete, including \$5 denomination, commemoratives, etc. Total catalog value nearly \$5.00! All for 5c to approval applicants. Write to-day! World-Wide Stamp Co., Box 600, Camden, New York.

PRODIGIOUS Anniversary package! Bi-colored banana airmail, Perak, savage Selangor, unique "green cross" charity, Wurtemberg, Kiwi bird, world's tiniest airmail, Sembilan, Portuguese commemorative, Siberia, striking pictorials. Only 5c with approvals! Saxon Company, 408A Jay Street, Brooklyn, N. Y.

AIRMAILS And commemoratives, 25 different, including Columbians, Panama-Pacific, Edison, Zeppelin, etc., only 5c with exceptionally fine United States and foreign approvals. Marco Stamp Co., Box 388, San Francisco, Calif.

50 BRITISH Colonials, premiums, lists, approvals, 10c. Northeast, Box 6618, Kansas City, Mo.

3 PHILIPPINES With approvals 3c postage. McLoughlin, North Avenue, Meriden, Conn.

GENEROUS Offer! Three triangles, Tanganyika, Newfoundland commemorative, giant map, U. S. \$5, scarce Manchukuo—29 pictorials. Extra! Spanish insurgent commemoratives. Everything 10c offered approval applicants. Tru-Value, Box P1412, Hartford, Connecticut.

FREE—23 Different Japan, also free hinges to approval applicants sending postage. Excel, Box 1315, Chicago.

UNITED States stamps on approval. Ranneger's, Box 134, Pittsburg, Kansas.

EARN Cash-stamps, sell my approval books. Nickel packets. Ellison, 2841 West 37th St., Brooklyn, New York.

FREE Collection 20 different Portugal for names and addresses of three active stamp collectors if approvals requested. Reimers, 500 Flatiron, Fort Worth, Texas.

FREE! 25 Different United States. Send 10c for 2 each Alexandrette, Bahrain, Nejd. (Approvals.) Arnosti, 465 Lexington, New York.

BIG Package stamps. Over 250 mixed with British Colonials. Only 5c to approval applicants. Washburn, Dept. D, 2224 Montana, El Paso, Texas.

50 VARIETIES Silver Jubilee \$4.50. 100 coronations \$5.00. 100 George 6th \$2.00. Lists free all countries. Ontario Stamp Co., Box 444, Toronto, Canada.

WONDERFUL Bargain — Coronations, Sierra Leone, Nigeria, New Mozambique, and 100 different others. Everything 10c to approval applicants. Dusenberry, 300 West 23 St., New York.

OVER 150 All different United States, Canada, Newfoundland only, including commems., free premiums, 30 cents, coin, stamps, L'Hernault, 204 West 76th Street, New York City.

APPROVALS As you like them. Superb, attractive, cheap. Ref. Bartolo, 23 Inguanez, Rabato, Malta.

5 DIFFERENT Stamp sets 15c. Paul, 2216 Clinton, Berwyn, Illinois.

HUGE! Seven colors! Four varieties Ecuador-United States constitution stamps with packet 50 others, 5c to approval applicants. Livingston, 218B, St. Ignace, Mich.

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APPROVALS Half cent and up. Andersen, 1341 Franklin, Milwaukee, Wis.

FREE—World's only octagonal (eight-sided) set to approval applicants. Charles Cleveland, 804 North Humphrey, Oak Park, Illinois.

100 DIFFERENT Including attractive triangle only 5c to approval applicants. Crystal Stamp Co., 3512 Leavenworth, Omaha, Nebr.

111 DIFFERENT Stamps 10c with approvals. Barclay & Sons, 407 S. Jackson, Kansas City, Mo.

33 DIFFERENT U. S. with approvals 6c. Reynolds Stamps, Flint, Mich.

THE World in a packet. An outstanding value! 100 stamps from 100 different countries, including Abyssinia, Afghanistan, Brunel, Falkland, Samoa and others from Africa, Asia, South America, West Indies, etc. Our pamphlet, which tells "How to Make a Stamp Collection Properly," together with our large bargain list of albums, packets, sets, etc. All for only 20c. Queen City Stamp Co., 604 Race St., Room 36, Cincinnati, Ohio.

100 U. S. 25c. Approvals, References. Napp, 1100 Euclid, Beloit, Wis.

ALL The world—Approvals one cent and up. Dee Taylor, Rocky Mount, N. C.

ZEPPELIN Hindenburg complete set 5c, approvals. French, 241 Euclid, Cleveland.

TRIANGLES! Triangles! Triangles! Triangles! Count them. Four! With famous Rivera nude stamp. Only 3c to approval applicants. Cactus Junior, Tucson, Arizona.

FINE Approvals, freshly filled books and sheets. Tell me what you want and I will send it. Milton Skinner, 306 East Fourth, Long Beach, Calif.

75% DISCOUNT. Send 25c, 50c or \$1.00, receive four times amount in stamps cataloging 3c up. Globe Sales, Box 505, Pontiac, Mich.

UNITED States approvals! Reasonable! Serious collectors! Box 822, Minneapolis, Minn.

ILLUSTRATED 2 Color letterheads, envelopes, 100 each \$1.00 postpaid. Professional Stationery, Nashville, Mich.

110 STAMP Free to approval applicants. Foote, 309 Grealey, Webster Groves, Mo.

FREE, Canada \$1 stamp to approval applicants. Munday, 1052 Manning Avenue, Verdun, Que.

30 DIFFERENT Canada 5c with approvals. Union Stamps, Kitchener, Ontario.

CLIPPERS, 1319; 1320; 1321; 50 Cents coin. Harrington, Babylon, N. Y.

105 STAMPS Including triangle, airmails, etc. 10c. Lufbery, Middletown, Connecticut.

STAMPS. A superb selection sent on approval. Quality at low prices. Fred Herzberg, Box 91-P, Elmhurst, Ill.

FREE, \$5.00 Stamp with approvals. Perley D. Porter, Wellesley, Mass.

UNPICKED! 100 U. S. revenues on documents—10c! 1000—60c! 500 different world—35c! Vanvorhis, Hyndman, Penna.

U. S.—63 different (commemoratives, airmail, etc.) with approvals 9c. 50 diff. commemoratives 1893 to date 25c. Moseley, 4932 Forestpark, St. Louis, Mo.

CASH For precancels and bicentennials. Judd, 661 Platt, Toledo, Ohio.

FREE. Treasure packet, 3c please. Oromotto Stamps, Kitchener, Ontario, Can.

CASH For stamp collections, accumulations. Jennie Graves, Phoenix Building, Holyoke, Mass.

PICTORIAL Exchange. Send 25 different stamps and 10c; receive 25 different foreign pictorials. Waldo, Box 266, Dallas, Texas.

NEWFOUNDLAND—15 Different including coronation, 10c to approval applicants. "Crescent Stamps." London, Canada.

30 FINE Stamps cataloging \$5.00, only 30c with approvals. Fort Pitt, 1711 Howard, Pittsburgh 12, Penna.

WORLD'S Small airmail, also world's largest diamond stamp, free stamp magazine! \$2.00 U. S. stamp, commemoratives, special issues, scarce stamps from 25 countries. 5c with approvals. Capital Stamps, Dept. PM, Little Rock, Arkansas.

5 DIAMOND Stamps 5c. Barcus, 1631 S. Lincoln, Denver, Colorado.

FREE. 21 Diff. pictorials, jubilees, coronation, new issues. No junk. 3c postage. Approvals. James Stamps, Stone St., New Bedford, Mass.

OVER 800 Obsolete U. S. stamps! Satisfaction guaranteed or money refunded. \$1.50 postpaid. George Wentz, Brownsville, Texas.

HUNGARY, 100, 6c. 25 Coins 20c. Malls Rubin, 11 Pitt St., New York City.

8mm., 16mm. FILMS, Cameras, projectors. Bargain list. Block, 1265 Broadway, New York.

114 DIFF. Stamps 10c with approvals. Dietze, 9711 117 St., Richmond Hill, N. Y.

U. S. Specials—1000 mixed, 15c. 150 different, \$1.00. 30 different commemoratives, 10c. Lee, Bridgeport, N. Y.

1857—1938 STAMPS At 1c and 2c each. Catalogue up to 10 times my prices. Leduc, Saint Petersburg, Florida.

PRECANCEL Approvals, 35 different for 2c to applicants. Gierhart, Baltimore, Ohio.

HEADQUARTERS For United States. Send 50 cents and two references for 50 different, including scarce 572 and 573. Approvals included. Price lists on request. R. M. Stamp Co., Box 230F, Port Chester, N. Y.

STAMP Approvals. Fine sea shell. Coins, want list solicited. Hobbies, 126 Narcissus, W. Palm Beach, Fla.

BARGAIN Fine sets cheap. Write. Sweeper, 101 Monmouth, Newark, N. J.

FREE! 25 Japanese, inclose postage, request approvals. Seerist, Muscatine, Iowa.

CZECHOSLOVAKIA—50 Different 10c; 100, 34c; 200, \$1.60. Fuld, Dickmann Building, Saint Louis, Missouri.

FIJI (Scarce) included forty country mixture—100 stamps, 10c; 300, 25c. No approvals. Elsea, Bowling Green, Ohio.

75 STAMPS From 75 countries only 10c to approval applicants. Maynard Sundman, D123, Bristol, Conn.

110 DIFFERENT, Caledonia. South American. Guinea, etc., 3c to approval applicants. Extra—Two scarce airmails added free! Hunziker Philatelic Service, Box 225-M, Minneapolis, Minn.

FREE. Looseleaf commemorative album with 4 pound mission mixture for \$2.00. LaGrange Park Stamps, LaGrange, Illinois.

GIANT Diamond-shaped stamp! Big packet 105 all different including Alexandra (new country), Congo, Manchukuo, Ecuador constitution, Costa Rica triangle, air-mails, commemoratives; giant diamond-shaped stamp, \$5 United States; set United States telegraphs, cataloging 30c. Packet British colonies including Burma (new country), jubilee and coronations; scarce sets 2 Siberia, cataloging 50c. Illustrated lists. Everything for only 5c to approval applicants! Write to-day! Mystic Stamp Co., Dept. 80, Camden, New York.

PANAMA Triangle and 50 others free to approval applicants sending 3c postage. Tatham Stampco, Springfield-30, Mass.

1939 ANNUAL Free—Features Canadians, Newfoundland, United States, colonials, foreigners, supplies. Sixty pages with hundreds of illustrations. Sent free. Gray Stamp Company, Dept. PM, Toronto, Canada.

WORLDWIDE Mixture (40 countries), South America, Orient, Africa, etc., including airmails and pictorials, 1,000, 35c; 3,000 (greater variety), \$1.00. 1,000 U. S. commemoratives (50 varieties, assorted) \$1.85; 500 (40 varieties) \$1.00. Wholesale Stamp Mart, 245 Broadway, New York.

EXCHANGE Stamps, postcards. Universe. "Exchangers," Bry 226 pres, Paris, France. Particulars free.

"ALL Pictorial" approval selections of medium priced air mails, commemoratives and new issues. Popular since 1929. Try us at least once. Norton Brothers, 2357 North 56th Street, Milwaukee, Wisconsin.

THE Panama constitution completes the entire U. S. constitution series. The flags of the United States and Panama in natural colors, the Statue of Liberty and the mottoes of each country make the Panama U. S. constitution stamps the most beautiful of the entire series. The U. S. constitution stamps issued by 13 different countries are now complete and getting scarce. We still have them all and will send them "on approval." The Panama set (2 values) will be sent for 10c to approval applicants. Approval Headquarters, Globus Stamp Company, 263 Fourth Ave., New York City, Dept. 201.

100 DIFFERENT U. S. 53c. Album Company, Box 344, Ft. Worth, Texas.

150 GOOD Mixed foreign stamps. 5c coin. Stanton, Niantic, Conn.

FREE 55 Different with approvals. Try our quality merchandise. Klipp, 2404 West Cherry, Milwaukee, Wis.

U. S. Approvals? Parks, used, complete 19c. Hubers, Palace Building, Minneapolis.

WORLDWIDE Mixture. Packet containing 1000, 25c. Plaza Stamp Co., Box 1161, Santa Fe, N. Mex.

30 COMMEMORATIVES 3c. Approvals. Story Service, 27½ Exchange Street, Gloucester, Massachusetts.

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INDIAN Native states, 100 different, dollar bill. Cruz, Post Box 10, Lahore, India.

POSTAGE Stamp collections bought and sold. Philatelic Headquarters, Trenton, New Jersey.

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M. M. earned \$267, three weeks, raising mushroom in cellar! Exceptional, but your cellar, shed perhaps suitable. We buy crops. Book free. United, 3848 Lincoln Ave., Dept. 70, Chicago.

FORMULAS—Fast selling products. Guaranteed. Laboratory tested. Lowest prices. Catalog free. Kemico, 55K, Park Ridge, Ill.

MAKE Money at home! Grow mushrooms in cellar or shed, with Ami U. S.-Patented Mushroom Spawn and step-by-step, easy-to-follow manual of instructions. Fascinating, profitable. Booklet free—write today. Anglo-American Mushroom Industries, Dept. 32, Toronto, Ont.

LOOK—Ambitious men and women. You who desire to forge ahead of the crowd, achieve money success and really live! Write now for free descriptive success literature that means accomplishment if properly followed. It is waiting for you. Ross C. McKiernan, P.O. Box 26, Galesburg, Illinois.

YOU'LL Like resilvering mirrors, auto-parts, reflectors, making chipped glass signs. Write. Sprinkle, Plater, 127, Marion, Indiana.

MAKE Color-Glazed concrete pottery, tiles, walls. New, patented method. Complete plants cost only \$35.00. Men (only). Write for free colorplate, details. National Potteries, 13 West 26th, Minneapolis, Minnesota.

"RUBBER Molds." Make them yourself. Formulas, instructions 25c. Ideal Service, 179RM, Park Ridge, Ill.

FREE List of 2556 occupations. Don't be a square peg in a round hole. Write today. No obligations. Vocational Guidance Bureau, 201 Park Ave., Dept. 2A, Baltimore, Maryland.

WORKABLE Mail order plans. Particulars in booklet 25 cents. J. E. Howe, Box 183, Evansville, Indiana.

MANUFACTURE Polishpuffs. Amazing proposition 10c. Particulars free. Hickory-dell, Glenbeulah, Wis.

107 WAYS to make money, in home or office, business of your own. Full particulars free. Elite Co., 214 Grand St., New York.

BUY 2c Lb., sell 50c to \$4.00 lb. Details 25c postpaid. Money-back guarantee. McArthur, Drawer 339-5, Butte, Montana.

A NEW Industry is born! Veg-O-Mat extracts delicious vegetable juices containing all minerals, vitamins. Highly recommended by physicians. Profitable repeat business. Particulars. Domestic Electric, 118 E. 28, New York City.

CAPITAL—Any purpose, how and where obtained, explained by nationally known expert. Particulars free. Capital Service, Arlington, Va.

MONEY in butterflies, moths. See Sinclair Display Advertisement on page 16A.

PLASTEX Industries offers industrious men an opportunity to start a business of their own, manufacturing art goods, novelties, souvenirs, etc., in Plastex and marble imitation. 5c material makes \$1 articles. Rubber moulds furnished for speed production. Small investment brings big returns. You are just in time for big wholesale season now starting. Write for interesting booklet mailed free. Plastex Industries, Dept. A, 1085 Washington Ave., New York.

STEADY Money in showcards, signs, window lettering. Easy. Amazing details free. Write Nelson Company, 2028 Manhattan Building, Chicago.

POPCORN Machines, caramelcrisp, crispettes, cheese coat, potato chips. Long Eakins, 2035-B High St., Springfield, Ohio.

CASH in on big demand for Mexican novelties! Large profits! Particulars free. Samples 10c stamps. Marquez-PBE, Apartado, 1176, Mexico, City.

SELL By mail. Books, novelties. Bargains! Big profits! Particulars free. E. Elfee, 438 N. Wells, Chicago.

BE Independent! Secrets of riches fascinatingly revealed. Details. Todd's Service, 262 Arlington, Youngstown, Ohio.

ELITE Collection of business plans, contains 107 tested plans and scores of formulas. Start own business; home, office. Particulars free. Elite Co., 214 Grand St., New York.

"MAKE Mirrors at home." Big profits. Little outlay. Also emboss, grind—foil, gold leaf, frost, chip and make imitation stained glass. Instruction course \$1.00. Ideal Service, Park Ridge, Ill.

1500% PROFIT! "Free 32-page book" tells you how to make genuine rubber molds and manufacture fast-selling composition novelties! Write Stewart's Studio, Dept. P-1, 2927 Wilcox, Chicago.

SOUTHERN Mineral deposits such as gold, copper, chromium, manganese, known to an experienced mining engineer, who wishes connection with parties interested in exploring and developing, or exploiting them. Address Mining Engineer, Box 1012, Hendersonville, North Carolina.

"SCHEMER," Alliance, Ohio (41st year) prints schemes, tips, opportunities, formulas; big producers: \$10,000 to \$25,000 reported. Year, \$1.00. Get wise! Trial six months only 30c.

MAKE Artificial marble, glazed tiles, uncanny. Tabletops, plaques, floors, homes, novelties. Hard, fireproof, inexpensive, cement secrets. Brilliant tile and liquid rubber samples 3c. John A. Paya, 945 Grande Vista Avenue, Los Angeles, Calif.

START Your own business. Make large profits. Sell new and used auction or bankrupt bargains in clothing and general merchandise. Experience unnecessary. Free wholesale catalog. Superior Jobbing, 1250-S Jefferson, Chicago.

"BINGO," New coin operated amusement game. Large income, operating "route." Small investment. Details free. Robbins, 1141P DeKalb Ave., Brooklyn, N. Y.

\$1.50 STARTS Your business. Stamp brings catalog. Colonial Arts, Derry, N. H.

CHARTERS: Delaware; best, cheapest; free forms. Colonial Charter Co., Wilmington, Del.

BRAND New unusual business opportunities. Free information. Research Development Laboratory, 449 South Ionia, Grand Rapids, Mich.

GIANT Mail, opportunities, added income, ideas, 52 page magazine. 10c. Katz, 4254 N. Kimball, Chicago.

BUSINESS Opportunities to have agents work for you. Free particulars. Tifford, Box 516, Louisville, Ky.

HANDY Men—Earn money home operating community "Fix-It" shop. Stafford, Makanda, Illinois.

START Business anywhere. Work mornings, home. God pay. Dunn, Box 74, Ionia, Michigan.

REAL Money-making opportunities at home. Big profits. Write John Yatesund, Sheboygan, Wisconsin.

INVESTIGATE Proposition of merit. Tremendous possibilities. \$10.00 required. American, 320 Drake Bldg., Irvington, N. J.

COLORFUL Novelties, big demand. Sample, prices, dime. Creations, Box 944, Laredo, Texas.

START Something! Prosperity books 10 cents. Dolsen, 89-91 Pineapple, Brooklyn, New York.

MAKE Money mailing and distributing circulars. Geiger, 6538 North Maplewood, Chicago.

PROFITABLE Home business. Legitimate. No canvassing. Maywood Publishers, P-923 Broadway, New York.

MAKE Your own molds. Use vulcanize Rubberite, our marblelike cement equals polished marble. Dime brings assorted samples. Novelty Supply Co., Grayling, Michigan.

SIGNS And showcards. Easily painted with letter patterns. Samples with instruction booklet mailed 10c. John Rahn, D1330 Central Ave., Chicago.

SOMETHING New! Mail order, local business selling vegetable concentrates. Finest quality! Your labels. Samples, dime. Details free. Gardena System, 1283P Station "S," Los Angeles.

WHERE To buy at lowest wholesale prices. Information free. Yorena, Box P-312, Bayonne, N. J.

6 MAIL Order magazines including all you should know about mail order business. 25c. Armand Cartier, 31 Cumberland St., Woonsocket, R. I.

DIME Brings money making plan. Chas. Hyde, 537 Ritter, Reading, Penna.

OPPORTUNITIES, Plans, income ideas, magazine 10c. Ready-2149, Jackson, Chicago.

AGENTS—Big profits, mailing our literature. Home business. Stamford, 3702-B Broadway, New York.

NOW 10c Copy. Prize contesting pays thousands. Facsimile Contest Journal, Box 335, Atlanta, Georgia. Amateur writers wanted. Details for stamp.

CAPITALIZE On your ideas. Send self-addressed stamped envelope for information. Allison-Items, Box 81, Bound Brook, N. J.

SUGGESTIONS: How and what to sell by mail. 3c brings details. Popto-Director, Drawer 989, Edinburg, Texas.

START 1939 Right! Manufacturing "Popular Branded Products." Stamp brings informative Formula Messenger telling how! Miller, Chemist, (Established 1897), 706-7B, Tampa, Florida.

PLEASANT, Profitable homework: Guarantees you income or double money back! Investigate now! Stamp brings particulars. Keep Working Industries, 5309 Forest, Dept. E, Kansas City, Missouri.

RECEIVE Stacks of mail: Your name listed in 10,000 directories 25c. Liberty Sales Service-A, Sheboygan, Wisconsin.

100 PROFITABLE Mail order and local plans. Gilbert Supply, 1107 Broadway, New York.

OPPORTUNITIES Aplenty! Money-makers that "click"! Unusual "idea" service! Copyrighted dollar folio 10c. Pianagram, P-1079 Madison St., Brooklyn, N. Y.

MOLDEX, Makes best rubber molds. Models, supplies. Pentucket Arts, Haverhill, Mass.

TIPS, Schemes, formulas. Sell your ideas. "Tipsheet" free with formula 25c. "SunShine," Box 912, Binghamton, N. Y.

TREASURE Finders? Read Goldak advertisement on page 133A.

PROFIT With new products. Make, sell, repeat. Analysis. Research. Guaranteed formulas. Biggest catalog free. Nominal prices. Gibson Laboratory, Chemists, BD-1142 Sunnyside, Chicago.

FINANCIAL Independence obtainable by placing coin operated merchandise vending machines, out on percentage basis, no experience required. Little capital needed, write for free details. Torr, 2047½ South 68th Street, Philadelphia, Pennsylvania.

MAKE Extra money. Buy old gold. 25c coin brings book detailing how to test weight without scales, what to pay, where to sell. Metal Research, Box 1959, Chicago.

"HOW To Hire Hundreds of Agents by Mail," secrets of three highly successful plans, 25c. McKean, 6220 Valley Rd., Kansas City, Mo.

START Profitable home mail business. Plan, samples, big magazine; dime. Coates, 77 Millet, Dorchester, Mass.

CAPITAL Seekers—Put your project before 260 key-men. Cost trifling. Details free. Amster Leonard, Fox Theater Building, Detroit, Michigan.

NEW Mail order plan for new product. Going over big. Write quick. Phelps, 1900-C Euclid Ave., Cleveland, Ohio.

EARN Up to \$500.00 back yard gardening. Stamp brings information. Lightning Speeds, Streator, Illinois.

\$1.90 PROFIT On each \$2.00 mail order. Guaranteed legitimate. Particulars free. Pop-Director, Drawer 989, Edinburg, Tex.

"1939 BUSINESS Folio." Send for free copy. Hutchison, 314 North Fourth, Camden, N. J.

DOLLARS in doughnuts. Plans for making 20 kinds \$2.00. Cook, Box 31, Swampscott, Mass.

EARN Extra money at home. You can increase your income quickly and easily at home. Wentworth supplies you with work and furnishes all materials. Write today for free booklet, Wentworth Pictorial Co., Ltd., Dept. 71, Hamilton, Ont.

MAKE Money electroplating! Marvelous patented invention plates with electric brush—easy as painting. Does same beautiful, permanent electroplating—gold, silver, nickel, cadmium, etc.—as big tank outfits. No liquids—lightweight—portable. Anyone can use from battery or household current. Only \$6.85 complete. Write for details and sample of work done. Warner Electric Co., 360 N. Michigan, Dept. D-11, Chicago.

SELL By mail. "The Key to Business Opportunities" shows how. Particulars for stamp. Maples, 3418 South Marshfield, Chicago, Illinois.

LIQUID Marble—anyone can make! Colorful, glazed! Moulded, brushed, sprayed. Rubberlastic moulds. Composition flooring. Big money in these! Particulars free. Marbleizing Service, Edwardsville, Ill.

MAIL Order business is your opportunity. Many began small, now earn thousands yearly. No personal contact. Boundless opportunities. Have had over 30 years experience: will help you succeed. Send 25c for valuable booklets, none free. B. Breniser, 257 S. 21st, Philadelphia.

HOW And where to obtain capital fully explained, free particulars. Star Service, Wapakoneta, Ohio.

WE Help start you in business, furnishing outfits and instructions, operating "Specialty Candy Factory" home. Men and women, opportunity to earn \$20 to \$50 weekly, all or spare time. (Our 29th year.) Booklet free. W. Hillyer Ragsdale, Inc., Drawer 4, East Orange, N. J.

LEARN Arc welding. A growing industry with great opportunities. Consult your local school, or if there is none available write The Lincoln School of Welding, Dept. A, Box 5758, Cleveland, Ohio.

SUCCEED With your products. Make-sell them. Formulas. Processes. Accurate analyses. Catalog free. B. Thaxly Co., Washington, D. C.

MAN In each town to plate auto parts, reflectors, bicycles, fixtures, mirrors, by late method. Simple plan of manufacturing at home starts you in good paying business. Free particulars and proofs. Gunmetal Co., Ave. H, Decatur, Ill.

AFTERNOONS Free for outdoors, shows. \$340 month home. Unique plans. No canvassing. Prepare for surprise. Folio-P, Station D, Los Angeles.

MANUFACTURE From Phospholene. Cleaning fluid 1c gallon; bleach 2c gallon; hand soap 2c pound; and ten fast sellers. Sample 25c. Details free. Western, 6615 Denison Ave., Cleveland, O.

LIKE To draw? Earn steady income tracing and duplicating advertising cartoons. Ad-Service, Argyle, Wis.

INVENTORS—We successfully sell inventions, patented and unpatented. Write for proof, and tell us what you have for sale. Chartered Institute of American Inventors, Dept. 4-C, Washington, D. C.

WANT More business? 3c daily, opens individual New York branch office resulting no room number on your stationery or advertisements. Co-operative Mail Service, 126 Lexington Avenue, New York.

PRIZE Contest money! You can win plenty! Stamp brings opportunity! National Contest Bulletin. (Dept. P.), Box 130, Grand Central Station, New York City.

I WANT To send you proof of the wonderful pulling power of Popular Mechanics Magazine's classified pages. What's your proposition? Write me today. F. W. Johnson, Manager Classified Advertising, 200 E. Ontario St., Chicago, Ill.

MONEYMAKING OPPORTUNITIES

GROW Flowers, plants, vegetables, year around, without soil. Simple, fascinating, inexpensive, profitable. Satisfaction guaranteed. Details free. Unique Gardening Club, Upsala, Minnesota.

BOBROW Recognized moneymaking books, folios by mail 10c each. Send for details and list. Anderson, Box 548, Muskogee, Okla.

RESULT Getter magazine, 1618 Lucia, Louisville, Ky., publishes money making opportunities, copy 10c.

YOU'LL Like resilvering mirrors, auto-parts, reflectors, making chipped glass signs. Write. Sprinkle, Plater, 287, Marion, Indiana.

25c BRINGS 24 Proven formulas. First-Ad Mart, E-300 North Cuyler, Oak Park, Ill.

MONEY In butterflies, moths. See Sinclair Display Advertisement on page 16A.

MAILORDER Plans, imprints, formulas, names. Davis, 337 River, Orange, Calif.

BIG Money easily made; 107 test plans for your choice. Home office. Descriptive booklet free. Elite Co., 214 Grand St., New York.

MILLION Articles. Buy wholesale. Valuable directory dime. Ideal Service, Park Ridge, Ill.

EASY To make money with imprint circulars. Booklet of instructions and samples, 25c. Atlas Service, Box 476, Red Lodge, Mont.

FREE—200 Big Moneymaking Ideas. Kay's, 2445 1/2 Brooklyn, Los Angeles.

MONEYMAKING Mail order proposition, details free. Lung, 323 E. Dewald, Ft. Wayne, Ind.

DIME Brings big package. Plans, formulas, envelopes, photo. William Co., Box 766, Wilmington, Delaware.

FREE Folio describes 2000 ways to make money. Marvin Studios, 203 South Dearborn, Chicago.

MONEY Jobs yours. Tell others how get dollars in mail daily. No selling. Opportunity of lifetime. Stingley, Box 225, Bell, California.

NAPOLEON, Bismarck, Foxie Grandpa and several other fast selling cakes and pastries will swell your bank account. Directions \$2.00. Cook, Box 31, Swampscott, Mass.

EMPLOYMENT Information. Individual service to fit your particular need. No books or gadgets to sell. Box 1646, Jacksonville, Florida.

WATERCULTURE. Grow flowers, vegetables, without soil, indoors, year round. Water and common chemicals used. Copyrighted, formula 25c. Hydroculture, Trenton, N. J.

MAKE Money mailing letters. 75c profit possible on each letter. McCants, Weslaco, Texas.

FREE Copy "24 Ways to Make Money," formulas, etc. Send name and 25c coin. We list you in "Opportunity Seekers Directory." Manufacturers, etc., will send you latest money making offers, catalogs, samples, etc. "Opportunities," Box 174-P, Elkhart, Indiana.

I WANT Ambitious, reliable persons to work with me contacting advertisers. Pietrantonio, 151 Fifth Ave., New York City.

ADDRESS Letters for us; big profits. Malone, Bayside, New York.

WHERE To buy exceptional articles at lowest wholesale. Information free. Stamford, 3762-C Broadway, New York.

FREE—100 Wonderful business, mail-order and home work moneymaking offers. Lewis Co., 828-C Carpenter, Oak Park, Illinois.

MILLIONS Jobless! Get dollars in mail for satisfying employment information. Keep dollars! We fill your orders. Details for stamp. Co-operative Service, 77 Swan, Buffalo, New York.

GROW Plants without soil. Folder free. Gordon Laboratories, 509-H Fifth Ave., New York.

EARN Extra money writing for publication. Simple method. Demand inexhaustible. Details free. Donna-Veretti, 17 Groton, Lowell, Mass.

\$25.00 STAMPING Names per 100 key-checks. Sample 25c. Outfits furnished. Bohn Company, Box 86P, Wilkes Barre, Penna.

TREASURE Finders? Read Goldak advertisement on page 135A.

ANALYSIS. Research. Newest guaranteed formulas. Biggest catalog free. Nominal prices. Gibson Laboratory, Chemists, CS-1142 Sunnyside, Chicago.

UP To \$60 weekly! Spare or full time. Capital and experience unnecessary. Your own advertising service. Something new. Your services always in big demand by everyone in business. Complete working plans, \$1.00. No other investment. Universal, Box 1461, San Antonio, Texas.

EARN Money at home. Adult or child. No canvassing. Details for stamp. Richmond Service, 504 Broadway, Sterling, Ill.

MOST Complete practical sensible legitimate mail order plan \$1.00. Hutchinson, Box 2025, Atlanta.

INTERESTED In making money? 3c stamp brings you amazing information. Universal Press Syndicate, Sarasota, Fla.

PROSPERITY For home workers. 52 page magazine. Sample, dime. Sizemore, 4917 N. Kostner, Chicago.

YOUR Name—5,000 mailing lists—25c. Get samples, opportunities galore from all over world. Pines, 563-A Monroe, Brooklyn, N. Y.

300 MONEYMAKING Plans 25c. Literature 3c. Morrell, 159-N State, Chicago.

TYPISTS Earn extra money. Send 25c (coin) for "Twenty-one Ways to Make Money With the Typewriter." H. Robbins, Box 6048, Kansas City, Missouri.

MAILORDER Opportunities, plans, formulas, information. Circulars free. Harvey Teeple, Decatur, Indiana.

STOP Squealing—Start crowing! Work mornings home—country drives or movies afternoons! No canvassing! Folio-A, Station "D," Los Angeles.

MAN In each town to plate auto parts, reflectors, bicycles, fixtures, mirrors, by late method. Simple plan of manufacturing at home starts you in good paying business. Free particulars and proofs. Gunmetal Co., Ave. N, Decatur, Ill.

RAISE Earthworms for profit. Information free, stamp appreciated. Bureau Zoological Research, 106A Broadway, Peoria, Ill.

WHOLESALE Sources, 500,000 articles. Free directory. Maywoode, 925 Broadway, New York.

FORMULAS, PLANS, ETC.

NEW Confection, resembles potato chips. Easily made. May Lee, 1629 Kennett, St. Louis, Mo.

ANALYSIS—Duplication guaranteed. Valuable formulas. Consultation. Associated Chemists, Indianapolis, Indiana.

GUARANTEED Formulas—New fast sellers. None better. Lowest prices. Catalog free. Kemico, 49K, Park Ridge, Ill.

ELITE Formulas and plans; make and sell your own products. Descriptive booklet free. Elite Co., 214 Grand St., New York.

FORMULAS—All kinds. Real money-makers. Lowest prices. Catalog free. Clover Formulary, Niles Center, Ill.

ANALYSIS. Research. Newest guaranteed formulas. Biggest catalog free. Nominal prices. Gibson Laboratory, Chemists, BD-1142 Sunnyside, Chicago.

BOOKLET Containing 40 auto specialty formulas, \$1.00. Excelsior Press, Box 182, Mar Vista, California.

GROW At home fruits, flowers, vegetables, without soil. New revolutionary method produces faster, less work. Season's supply chemicals, directions, formula, bibliography, all \$1.00 postpaid. Chemiculture, 4701-P Sheridan, Chicago.

10 LABORATORY-TESTED Formulas. Including waterless hand cleaner. \$1.00. Beach, Box 156, Groton, Conn.

200 GUARANTEED Tested formulas 25c. Box 67, Columbus, Indiana.

ANTI-FOG. Anti-frost (windshield). Formulas 25c. Tom Moore, Chemist, Waterloo, Iowa.

SENSATIONAL! Modern formulas 1c each! Literature free! Galluzzo, Wilkesburg, Pennsylvania.

"ANYTHING In formulas." Particulars free. "Research Bureau," 160 Chelsea, Charlestown, Massachusetts.

MAKE More money! Manufacturing "Popular Branded Products." Stamp brings informative Formula Messenger telling how! Miller, Chemist, (Established 1897), 706-FI, Tampa, Florida.

ANY Formula 25c, six \$1.00. Chloro Chemical Co., Box 478, Salina, Kansas.

200 TESTED Formulas \$1.00. Joseph Saleg, 633 Collins, Joliet, Illinois.

JUST Name it! Any formula 25c or money back. Satisfaction guaranteed! Worl's Formula Bureau, Tampa, Florida.

VALUABLE 48 page formula book of 110 sure winners 50c. Bielefeld Co., New Knoxville, Ohio.

FORMULAS—Moneymaking, fast selling products. Literature free. J. Watson Company, Stockyards Station, Kansas City, Mo.

THAXLY Formulas for perfect products. Accurate analysis assured. Resultful research. Catalog free. B. Thaxly Co., Washington, D. C.

FORMULAS: 15 Proven moneymaking formulas \$1.00. (Not stock-formula catalogue stuff), real unusual offers. List free. Marvel Laboratories, 6629 No. Maplewood, Chicago.

FORMULAS. Latest money makers. Literature free. Belfort, 4042 N. Keeler, Chicago.

CHEMISTRY

CHEMICALS In 5c quantities. Catalog 5c. Fleischer's Laboratories, Everett, Mass.

FREE—40 Page catalog of chemical and laboratory supplies for amateur chemists. Wollensak microscopes and supplies, scientific books at big discount. J. D. Winn, 124 West 23 Street, New York City.

CHEMICALS. Laboratory, glassware, apparatus. Send 3c for catalog CPL. Biological Supply Company, 1176 Mt. Hope Avenue, Rochester, N. Y.

FREE Chemistry catalog. Supplies at 5c! Equip complete laboratory. Send 3c for postage. Kemkit Scientific Corp., 397P Bridge St., Brooklyn, N. Y.

TELESCOPES. Microscopes, chemistry, mineralogy. Scientific catalog free. Tracey Laboratories, Evanston, Illinois.

AGENTS WANTED

MEN! Women! Operate quick money-making route in choice localities or work right from your home. Excellent year round earnings. Just give away valuable premiums and samples with famous quality coffee, spices, soaps, flavorings—300 everyday necessities. Also \$500.00 yearly bonus and big display to all qualified dealers. Experience unnecessary. Part time workers welcome. Togstad Company, Dept. B-16, Kokomo, Indiana.

PERMANENT Representative wanted for Hoover uniforms to call on restaurants, hotels, beauty parlors, doctors, nurses, others. Excellent immediate income. Leads furnished. Valuable equipment free. Hoover, Dept. AJ-B, 251 W. 19th, New York.

GUARANTEED Gold leaf letters for store and office windows. 300% profit. Free samples. Metallic Co., 436-B N. Clark, Chicago.

LET Me send you \$5.00 worth actual sample food products and household necessities free. Finest quality. Look after coffee and tea route. No experience. No investment. Bright future. Blair, Dept. 31-E, Lynchburg, Va.

500% PROFIT With new perfected (1939) quick-action, no flint, automatic gas lighter. Retail 25c. Sample 5c. New Method Co., Box PMG-74, Bradford, Penna.

DISTRIBUTORS—Supply revolutionary corn remover to stores. New sales plan results in landslide of orders. 150% profit. Exclusive franchise. Great Christopher Corp., Buffalo, New York.

SAMPLE To smokers. Mail 6c in stamps—Sweet Tobak, rich flowery tropical mix with a delicate aroma. Distributors wanted. Specialty Forum, 9441 Pleasant Ave., Chicago.

UP TO \$6.00 an hour. Amazing Kar-Nu beautifies old cars with sparkling new finish—without rubbing, polishing, waxing, painting. Costs little. Wipes on with cloth. Lasts 6-12 months. Free sample, Kar-Nu, Dept. P-4, Cincinnati, Ohio.

HOME Service repairmen: Sell, install overhead garage door hardware. Pays well. Circular free. Wilkie, Independence, Mo.

IF Earnings up to \$45 first week will satisfy you, I'll send complete outfit to run home-operated grocery agency. Absolutely no money risk. Details sent free. Write Albert Mills, 3207 Monmouth, Cincinnati, Ohio.

212% PROFIT Selling amazing new liquid mender. Fixes most anything; unlimited demand. Write for free sample proof. Indiana Laboratories, Dept. T-29, Elkhart, Ind.

SELL Artistic oil painted personal portraits! Portraiture, 826 Noble, Chicago.

MONEY In butterflies, moths. See Sinclair Display Advertisement on page 16A.

FASTEST Money-maker selling reversible tapesties. Lifetime chance. Write Yale-Clothing, Meriden, Conn.

BUSINESS Proposition resilvering mirrors, autographs, reflectors, making chipped glass signs. Write, Sprinkle, Plater, 128, Marion, Indiana.

MYSTERY Invention, carried in pocket, keeps hands, feet, ears, body warm on coldest days. Lasts years. Everybody buys—workmen, housewives, schoolboys, farmers, others. Low priced—big profits. Write quick. Kumfy Warmer, Dept. T-2301, Cincinnati, O.

HIGH Grade window letters 11c each. Free samples. Metallic Co., 438-A North Clark, Chicago.

YOUR Own shoes free as bonus, quick cash commissions showing complete shoe line. Experience unnecessary. Selling outfit free. Tanners Shoe Co., 907 Boston, Mass.

AMAZING! Free whipcord caps to hat customers. Easy orders, big profits with exciting offer! Sample outfit free. Taylor, 15 51st, Dept. E-22, Cincinnati, Ohio.

GRANITE Monuments \$9.00 up lettered, delivered. Catalog. Mikelich Company, Saint Cloud, Minnesota.

FREE Catalog—Sell foods. Repeats. Write immediately. Saphore, Manager, 170 1/2 Monticello, Jersey City, N. J.

PARING Knife. New sensational peeler. 200% profit. Sample 10c. Three other household necessities. Apex Co., 400 Dakota Bldg., St. Paul, Minn.

BEAUTIFUL Bird pictures handmade with genuine feathers. Sell on sight! Large profits! Free particulars. Samples 10c stamps. Marquez-PG, Apartado 1176, Mexico City.

SENSATIONAL New desk type pinning machine for semi-permanent fastenings. A really new item which finds ready acceptance in industrial concerns, offices and stores. Not competitive with stapling machines and protected by basic patents. Excellent commissions and a real repeat business on pin refills. Young, intelligent men, age 33-30, wanted as selling agents in all cities over 10,000 population. Write immediately for complete details. Box No. 111, 56 W. Washington St., Chicago, Ill.

NEW Register shield; protects walls, humidifies, traps dust. Sample 35c. Paramount Produx, 1834 Marx, Detroit.

AGENTS—Big profits, mailing our literature. Home business. Stamford, 3762-D Broadway, New York.

SEND (Ten cents) for samples of prunes, dates, figs, and nuts. Agent proposition. Prunade Growers Association, Hollywood, Calif.

EXTRAORDINARY 1939 Profits! Manufacturing "Popular Branded Products." Stamp brings informative Formula Messenger telling how! Miller, Chemist, (Established 1897), 709-Pa, Tampa, Florida.

FREE Sample world's best seller. G. Mfg. Co., Washingtonville, Ohio.

SELL Stores, taverns, gas stations 1939 sparking 25c Gem signs. Cost 5c. Gem, 4327-M Harrison, Chicago.

500% PROFIT. Modernistic guaranteed Stick-on letters for windows, offices, trucks. Large sizes 1c. Easily applied. Free samples. Modernistic, B-3000 Lincoln, Chicago.

EX-O-LENE. New, red-hot, repeat auto product. Guaranteed. Millions waiting. To 500% profits. Information free. Thermo Exolene Works, Peoria, Ill.

PROFIT With new products. Make, sell, repeat. Analysis. Research. Guaranteed formulas. Biggest catalog free. Nominal prices. Gibson Laboratory, Chemists, BD-1142 Sunnyside, Chicago.

STRANGE Chemical sponge cleans wall-paper like magic. Banishes housecleaning drudgery. Sensational demonstration. Samples sent on trial. Rush name. Kristee 102, Akron, Ohio.

MILLIONS Of prospects! Buyers everywhere! Sensational social security plates! Tremendous value! Fast seller! Big profits! Complete selling outfit free! Union Specialty, 1775-A Broadway, New York.

CREW Managers and distributors wanted. All-year-round seller. Free sample. Klean-Well Products, Box 1324, Youngstown, Ohio.

AGENTS! Smash go prices! Santos coffee 12c lb. 4-oz. vanilla 8 1/2c. Razor blades 10 for 8 1/2c. 100 sticks chewing gum 12c. 150 other bargains. Premiums. Experience unnecessary. Carnation Company, P.O. St. Louis, Mo.

SALESMEN Wanted. Sell business cards, commission. Willmar Press, 674 Main St., Pawtucket, R. I.

PROFIT 100% Selling calling cards. Bonus, prizes to workers. Outfit free. Universal, Orange, Massachusetts.

AGENTS—Opportunity make money; book containing 107 successful business plans; home-office; send for free introductory booklet. Elite Co., 214 Grand St., New York.

AGENTS Make big profits on food products, bargain deals. Low wholesale prices. Rush name for trial outfit offer. Ho-Ro-Co, 2810-R Dodier, St. Louis, Mo.

SUCCEED With your products. Make-sell them. Formulas. Processes. Accurate analyses. Catalog free. B. Thaxly Co., Washington, D. C.

STARTLING Invention—Pocket adding machine. Nationally advertised \$2.50. Whirlwind seller. Big profits. Baby Calculator Co., Box 1118, Chicago.

BIG Money applying initials on automobiles. Write for particulars and free samples. American Letter Company, Dept. 40, Dunellen, New Jersey.

AGENTS—To mail our literature. Good profits. Home business. Maywood, 149 Fifth Ave., New York.

FREE Sample—Amazing cleaner; sells homes, taverns, everywhere. Big profit—fast repeater. Beteo, 5007 Irving Park, Chicago.

MANUFACTURE Specialties. Hire agents yourself. Big money. Free literature. Gilbert Supply, 1107-P Broadway, New York.

AGENTS: Stamping names on pocket-key protectors. Sample check with your name, address, 25c. Stamping outfits. Emblem checks, check-fobs, name plates. Hart Mfg. Co., 303 Degraw St., Brooklyn, N. Y.

ENGRAVED Name plates, numbers, signs, etc., easily sold, profits large. Brett Bros., Wintthrop, Mass.

REVOLUTIONARY Window cleaning tool. Good Housekeeping approval. Only ten \$2.25 sales daily to housewives, factories, schools, stores will make you \$350.00 monthly. Carter Products Corp., 900 Front Ave., Cleveland, Ohio.

ATLAS Window sign letters. Large sizes, penny each. Beautiful free samples. Atlas, 7941 Halsted, Chicago.

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TREASURE Finders? Read Goldak advertisement on page 133A.

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TREASURE Finders? Read Goldak advertisement on page 133A.

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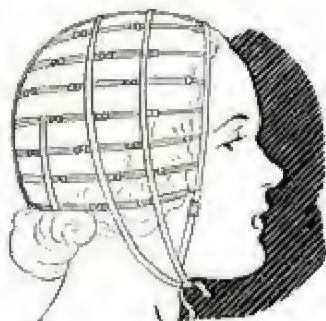
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NEW INVENTIONS H1323

(Continued from page 33A)

SOMETHING new in hair-waving devices has just been patented. It consists



of a netlike flexible webbing adapted to be secured to the head. It incorporates a number of parallel strands with a series of combs that slide on the strands. Each comb has a

number of teeth for holding the hair in position to produce the wave effect. Sliding the combs along the strands aids in training the hair in the direction desired. The entire device is worn like a cap while the hair is being waved.

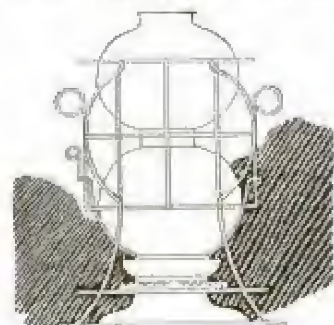
FOR the use of amateur or professional, a handy wrench has been patented. It

consists of a hollow handle with openings on one side and slots on the other. To the handle, at the top, is attached a flexible metal band. The free end of the band is shaped to



engage the slots. The wrench is operated by fastening the band around a nut or bolt and securing the free end in one of the slots. Round screw caps also may be turned by this means.

ANY housewife who has used the various types of glass coffee makers now



on the market knows how difficult it is to prevent breakage of top or bottom bowls. A patent for a coffee-maker safety guard has been issued. It consists of

an openwork cage-like frame supported on the base of the coffee maker. The frame holds the glass bowls firmly enough to prevent tipping or dropping.

(Continued to page 58A)

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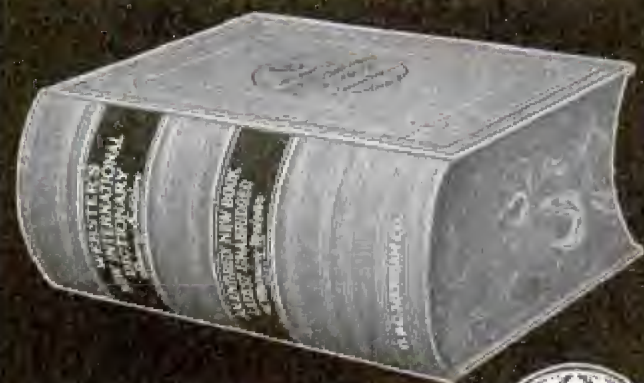
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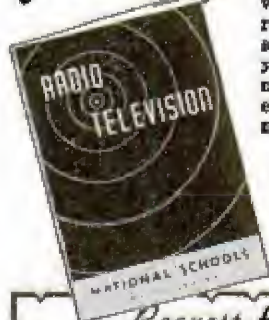
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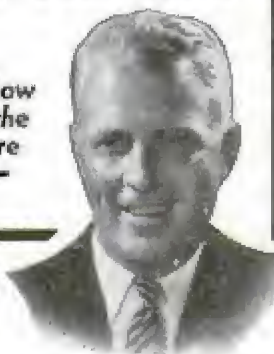
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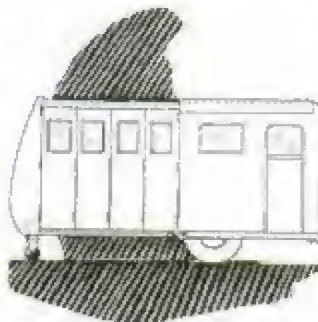
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NEW INVENTIONS

(Continued from page 51A)

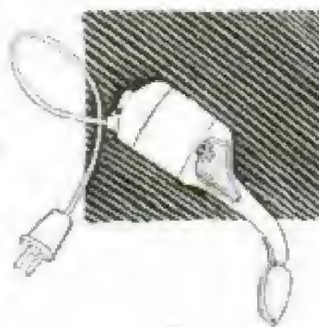
EVIDENTLY designed to overcome the lack of space in an ordinary trailer, an



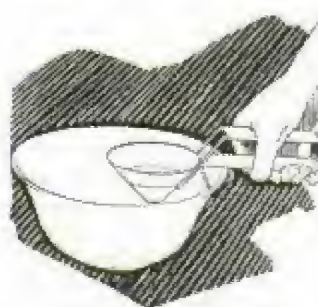
extensible camping vehicle has been patented. The front section is built rigidly for living purposes, while the rear section is arranged to align with the outer contours of the

front section when the trailer is closed, the two sections telescoping. The roof of the back section slides into a pocket in the roof of the front section when not in use.

EFFICIENT and fast cleansing of the teeth, with minimum effort, is the purpose of an electric toothbrush patented a short time ago. A small motor drives a spindle fitted with bristles, taking all the work out of brushing the teeth.



HANDY for the housewife is a new kitchen tool, an easily operated egg



separator. It consists of a funnel, a cup on the bottom of the funnel and a spring grip with one portion attached to the funnel and the other to the cup. Closing the spring grip

moves the cup away from the funnel, thus allowing the white portion of the egg to escape but retaining the yolk. The separator has a clamp for fastening on the rim of a bowl.

Due to the fact that many of the devices described in this department are still in the patent office stage and are not on the market, Popular Mechanics Magazine cannot undertake to supply further information regarding them.



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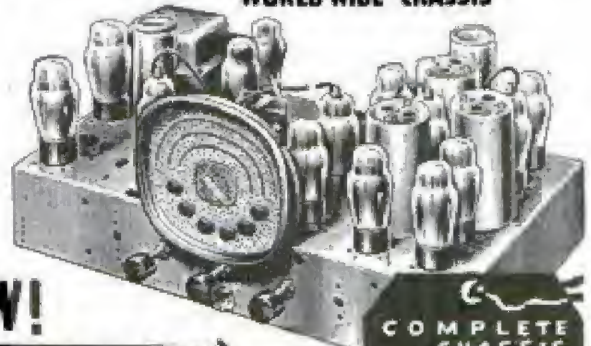
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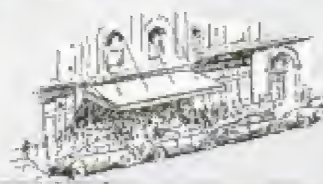
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PRINCE ALBERT THE NATIONAL JOY SMOKE

Popular Mechanics Magazine

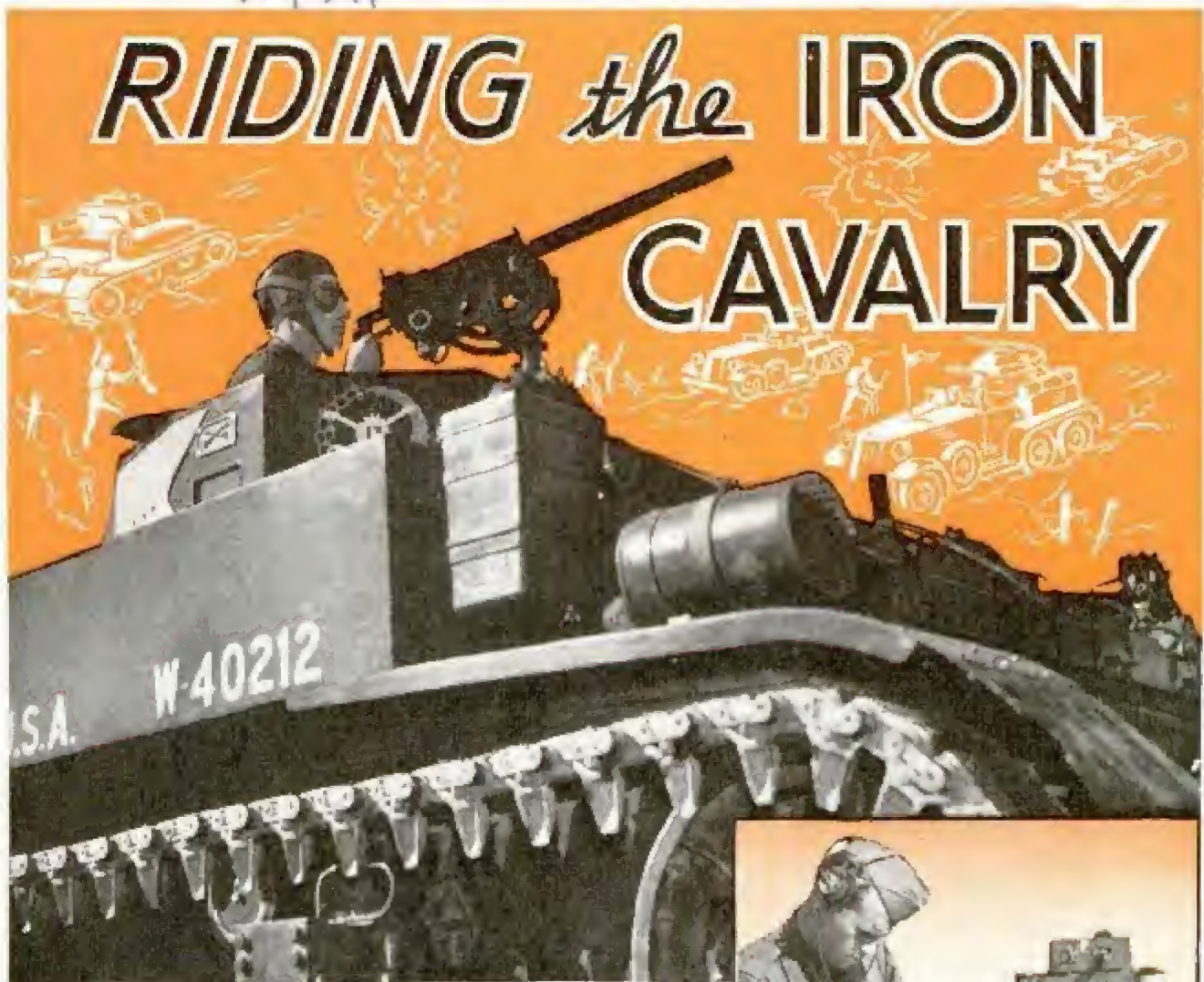
REGISTERED IN U. S. PATENT OFFICE AND CANADA

WRITTEN SO YOU CAN UNDERSTAND IT

Vol. 71

FEBRUARY, 1939

No. 2



PUT on your helmet, adjust your dust goggles—you're going for a ride with Uncle Sam's new streamline fighting unit, the mechanized cavalry.

And it's not just a spin around the parade grounds, either, but a 750-mile trip to maneuvers. The schedule calls for 150 miles a day with road speeds of twenty and thirty miles an hour—no easy pace for 648 tanks, armored cars, trucks and motorcycles to maintain. They want to find if the new war machines can take it.

Before the Seventh Cavalry brigade, as the unit is called, starts rolling, let's look at some of the sleek iron horses. First, the scout cars, armored on the front, sides and rear but open at the top. These machines are for reconnaissance, or information seeking, and travel ahead of the column. Each of the



Top, anti-aircraft gun in rear of turret of combat car. Below, taking radio message while iron cavalry is rolling

Cont James Mc Queeny

Kansas City, Mo



seventy-four cars has a .30-caliber and a .50 machine gun. A railing around the top of each vehicle serves as a track for the guns, permitting anti-aircraft as well as all-direction firing.

Nineteen heavier cars also are used in scouting work. They are completely enclosed and have six wheels with a four-wheel drive. There is little difference in the armaments of the two. The real backbone of this fighting force is the combat car, much like the light infantry tank.

The squat, turreted machine has both maneuverability and speed. The motor, located in the rear, has cylinders set in a circle around the drive shaft like an airplane radial engine. Rolling on rubber-coated "Caterpillar" treads, the combat car can do fifty-five miles an hour. There are 112 of them and their guns would fill an arsenal. The standard equipment includes a .30-caliber cowl machine gun; a .30 and a .50 turret gun, and at the rear of the tower, a .30 anti-aircraft gun.

When Italy's tanks were campaigning in Ethiopia natives hopped on some and with heavy stones put the protruding machine guns on the blink. That couldn't happen to this outfit—the crews are armed with Tommy guns and pistols fired through special portholes.

Formidable in appearance and important in battle are twelve 4.6-inch chemical mortars mounted on trucks, designed to throw twenty-five-pound smoke shells to screen off the brigade's movements from hostile eyes. There are also seventy-four trucks with half tracks, used to transport machine guns and crews employed in ground sup-



Part of an encampment made by the Seventh Cavalry Brigade while on a 750-mile trip between Fort Knox, Ky., and Fort Riley, Kans. Above, armored scout car used in reconnaissance work

port, and for other personnel of the command. Sixteen of the brigade's 172 trucks are assigned to tow seventy-five-millimeter field guns used in action for artillery preparation before a general brigade attack. Others are for ammunition and artillery supplies. Also some of the trucks comprise a squadron supply train; others are employed in maintaining military vehicles, gasoline trucks and field kitchen equipment.

Lined up on the highway, the cavalry presents a vivid picture of rolling night. The column is twenty miles long. Everything is on wheels and when the mechanized cavalry arrives at its destination, there is no delay—its full fighting strength can take off its coat and go to work.

Your pulse quickens as you climb into a combat car. There is a clatter

(Continued to page 150A)

Right, headgear worn by tank riders. Below, the iron cavalry on the march. Bottom, four-wheel drive armored car



Thirteen-Ton Air Streamliner Has Seats for Twenty-Two

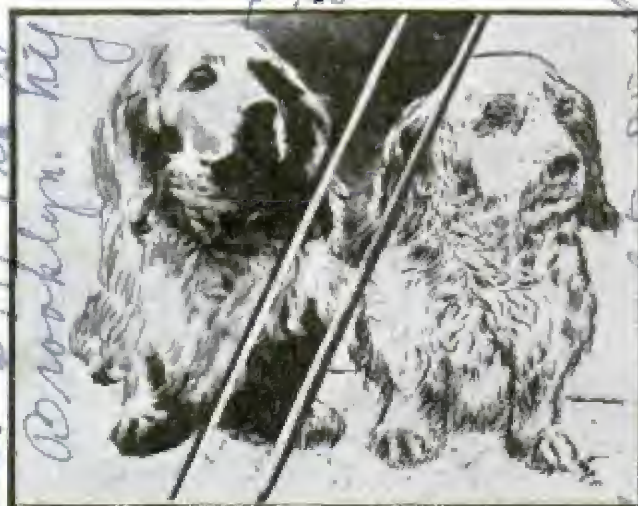


Nose of the new British streamline ship. Note flowing lines of engine nacelles and the front of passenger compartment

Described as the nearest approach to a completely streamline plane, a thirteen-ton transport has just been added to Imperial Airways' fleet. It will be used in European service. The big streamliner, which is seventy-one and one-half feet long, has a wing span of 105 feet and accommodations for twenty-two passengers.

Ink Sketches Made from Photos with Aid of Simple Kit

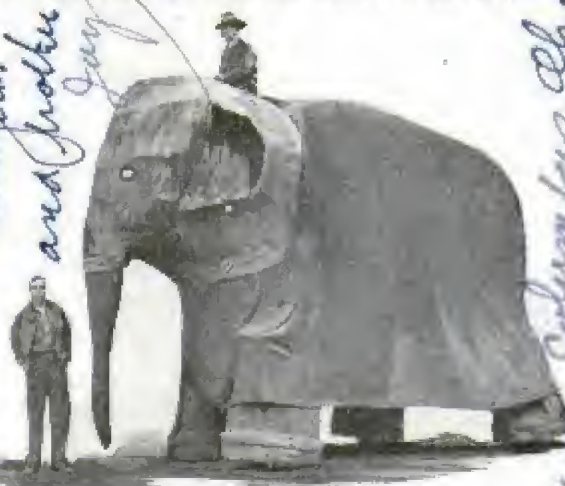
Anyone can make pen-and-ink drawings from photographs with the aid of a simple



Left photograph from which ink sketch (right) was made with simple outfit

kit now on the market. First, the user goes over the outline of the drawing with a pen and waterproof ink, filling in the shadows of the photograph and then, with a simple solution of chemicals supplied in the outfit, bleaches out the photograph, leaving the pen-and-ink drawing intact. There are numerous practical applications of photo sketching in addition to the appeal it has for photographers, hobbyists, artists and children. Artists use the process to make drawings from which line cuts can be made, instead of expensive half tones which a photograph necessitates.

Lifelike Mechanical Elephant Can Run, Walk and Dance



From his seat atop the neck, the driver can make this mechanical elephant run, walk or dance

When an elephant turns down a bale of hay for a bucket of gasoline, it's news. Jumbo is that kind of an elephant. Motor-driven, it walks, runs and dances, with natural leg movements simulated by an over-running clutch. Jumbo averages twenty miles to the gallon. With the driver atop its neck, the elephant has toured 15,000 miles on an advertising campaign. Several more are being built to carry passengers and advertising at the New York world's fair. The frame is of wood and chicken wire.

Built by George and Leonard Hutton.

kit now on the market. First, the user goes over the outline of the drawing with a pen and waterproof ink, filling in the shadows of the photograph and then, with a simple solution of chemicals supplied in the outfit, bleaches out the photograph, leaving the pen-and-ink drawing intact. There are numerous practical applications of photo sketching in addition to the appeal it has for photographers, hobbyists, artists and children. Artists use the process to make drawings from which line cuts can be made, instead of expensive half tones which a photograph necessitates.

Stratosphere 'Diving Suit' Carries Bottled Air

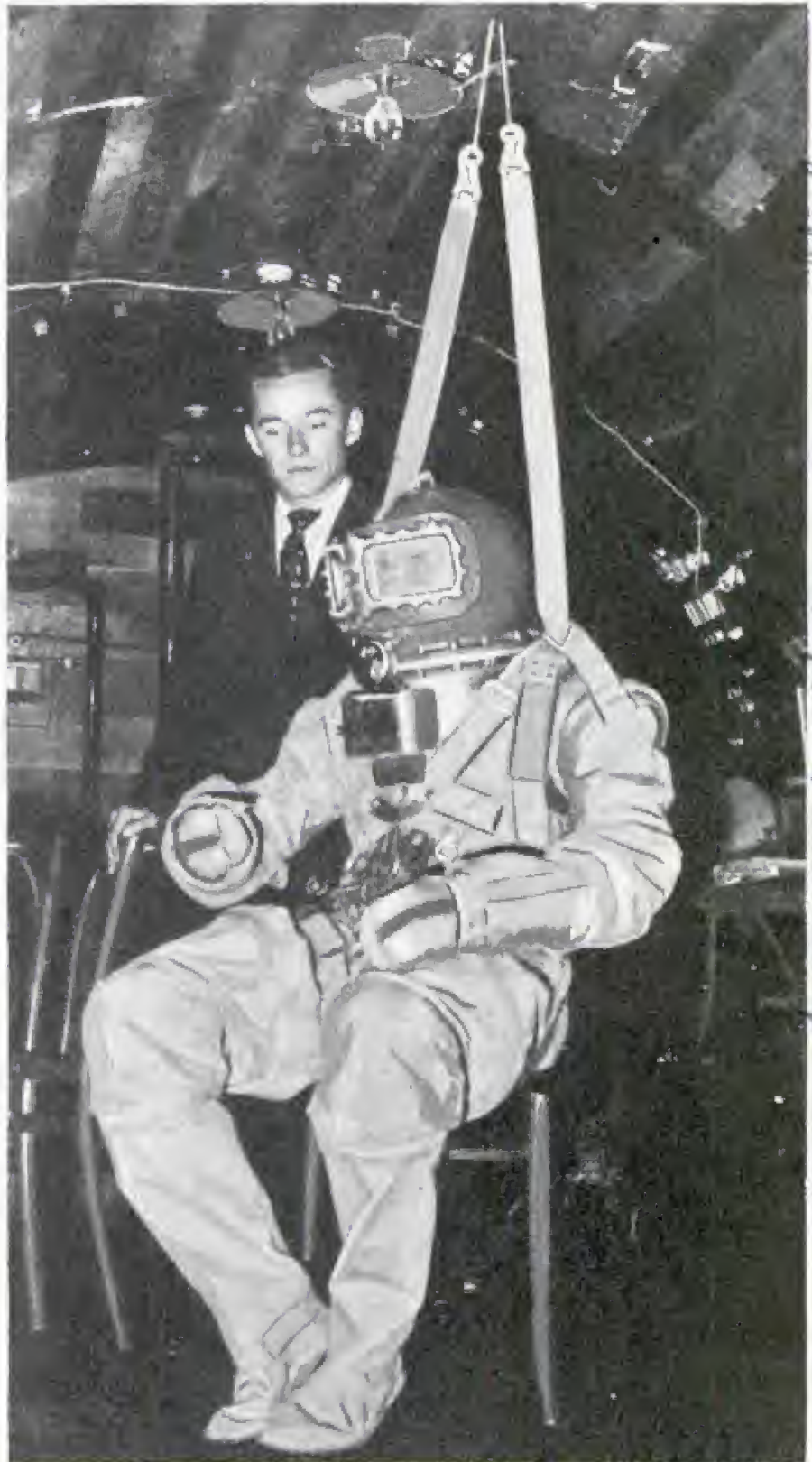
Closely resembling a deep-sea diver's suit, a stratosphere dress was tested recently in the high altitudes by a parachute jumper who leaped from an airplane at 30,000 feet. Instead of the diver's air-feed hose, the suit is equipped with oxygen bottles which supply air, making the wearer completely independent of the thin mixture found high above the earth. The suit also protects the airman from low pressure found in the stratosphere and sub-stratosphere.

1450

Bombproof Panama Canal Will Look Streamlined

Panama canal will take on a more streamline appearance when the "bombproofing" now contemplated is put into effect. While the locks themselves cannot be armored effectively to withstand powerful explosives, the canal walls can be strengthened and many structures vital to operation may be bombproofed in the literal sense. Electric power stations, fuel oil tanks, garages for the towing locomotives or "electric mules," operating stations, machine shops, administrative offices, living quarters for the operating force and barracks for the garrison, all can be put deep underground and thickly shielded with concrete. This will remove exposed moving parts to points where they will be protected against flying fragments. Power for the "electric mules" already is drawn

from an underground trolley. A thick shell of armor could be worked in over the subterranean carrier of electricity. Removing many structures now on the surface will give the canal a more streamline aspect.



When you make a 30,000-foot parachute jump, here's your uniform. It seals you against low pressure, and you carry your air in bottles

Tested at Villeneuve-St. George
airfield by French air

Subsea Service 11/29/38

H1353

Womans Hospital
U. of Pittsburgh Medical Center

Fighting

Left, alternating-current arc welding enables builders to erect a hospital next door to three other hospitals without noise. Below, using noise meter to measure sound created by high-voltage discharge between power line and insulator atop crossarm

Photographs courtesy
Westinghouse Electric and
Manufacturing company



Here a tiny mirror is being used to reflect a light beam into photoelectric cells to measure stretch of steel caused by magneto-striction

STRIVING to make the world of tomorrow a quieter place than that of today, scientists are employing light as an anti-noise weapon. Sharp, tiny beams and pale, flickering rays are being directed on metals in industry's attempt to silence the clatter of machinery.

An "electric eye" is being used to measure the growth of metals under the pounding of a noise-maker called magneto-striction. Research engineers of Westinghouse Electric and Manufacturing company describe magneto-striction as

E. Pittsburgh, Pa.

engineer C. O. Aggero

Noise with Light

the property of magnetic metals, such as iron, to lengthen or shorten in an electromagnetic field. The lengthening and shortening of the metal set up vibrations which create midget pressure waves in the air. These little air waves not only cause vibrations in electrical machines, but make themselves heard as a buzzing or humming sound.

Because of the minuteness of these metallic changes, engineers have been handicapped, in fact, almost completely baffled, in their efforts to stop them, or even measure them. S. L. Bürgwin of Westinghouse, in cooperation



Top, apparatus using light beams to measure lengthening effect of magnetostriction, a noise-maker. Center, diagnosing noise inside motor coach. Bottom, using balancing machine to test rotor

with metallurgists seeking to produce a noise-free metal for electrical machine construction, has developed an electric-eye yardstick, using direct current to measure the simple change in length of steel test strips, detecting improvements and failures in the new metals.

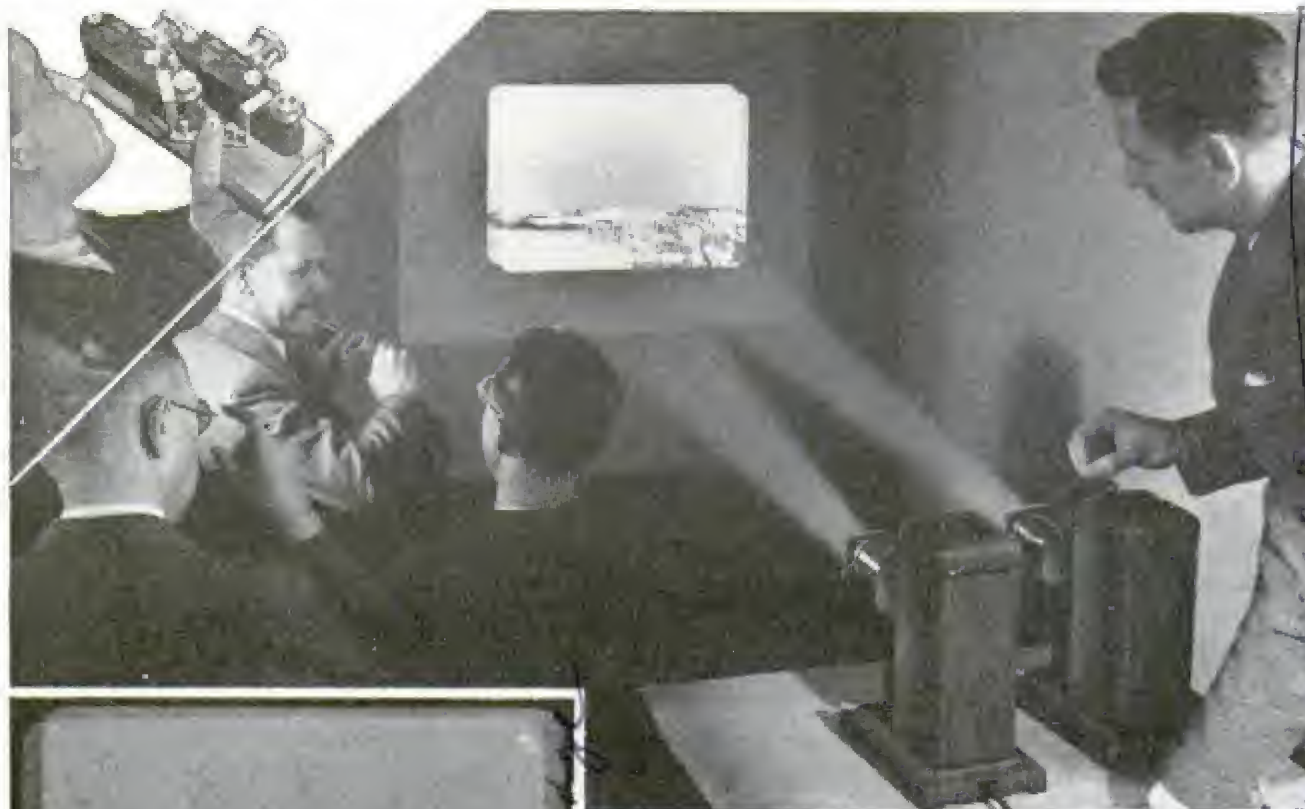
Interference of friction has been overcome by a system of ball bearings on a supporting brass bar on which the test strip rests while being measured. By placing another heavy brass bar on top of

(Continued to page 127A)

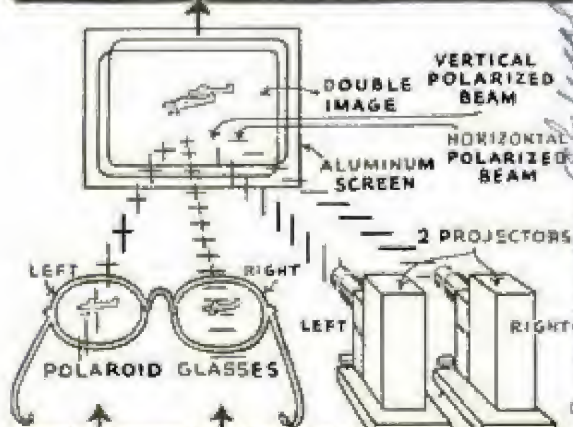
W. O. Olson, research engineer

T. C. Orching research

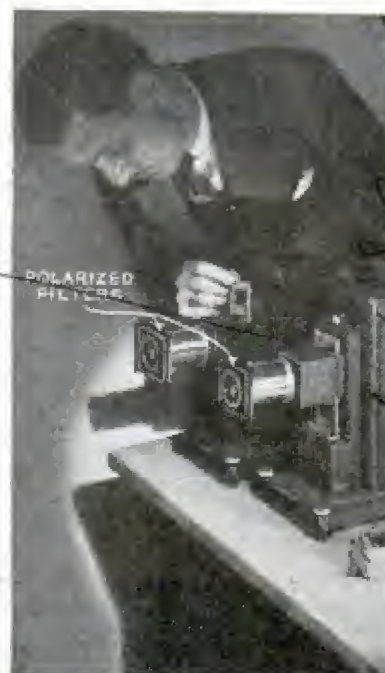
Projecting Three-Dimension Pictures in Color



Top, snapping three-dimension picture with twin cameras and projecting twin slides for audience wearing Polaroid glasses; below, projectors with polarized filters. Left, overlapping image seen on screen with naked eye and, below, with glasses. Diagram shows how filters bring separate image to each eye



Third-dimension pictures in natural color, breath-taking in their effect of space and distance, can be projected on your home screen. Polaroid glass makes possible this magic effect. The first step is to snap twin pictures simultaneously with two cameras eye-distance apart. Mount the color slides and project them with two projectors, side by side, with opposite Polaroid filters over their lenses. The slightly-overlapping pictures on the screen appear as a sharply defined three-dimension scene when Polaroid glasses are worn, the polarization of the right eye glass matching that of the filter on the right projector.



for H. Canada
& presence
Polaroid Corp. Cambridge Mass.
Sept 7 30

R1074 Cont. Thomas G. Swenson, Jr.
10555 Holman Ave
Los Angeles, Calif.

Taming DEATH VALLEY



Over Death Valley's modern highway, above, moves a twenty-mule team reminiscent of pioneer days. Below, a Shoshone squaw with rugs and basket for tourist trade

DEATH Valley, one of the hottest and most awesome regions on earth, today is being transformed into a pleasant winter resort. Last year thousands of people visited the barren area in which scores perished from heat and thirst in the past.

Taming the desert, into which few people ever had the courage to venture and from which fewer returned, has been accomplished by building a few hundred miles of oiled automobile roads, developing the few water holes in the mountains, and making water available at other points. Today the tourist can drive at his ease through the Funeral and Panamint mountains, to Furnace Creek, the Devil's Golf Course, and through country that only Indians and hardy prospectors had visited before.



Defunct - Death Valley National Cemetery
Monument - Death Valley



This sinister region in the Mojave desert in eastern California is a weird and fantastic geological wonderland, a mineral museum containing everything from potash and borax to copper and gold. In one part, a short walk takes you across adjoining deposits of copper, silver, turquoise, asbestos and silica. Death Valley itself is a narrow rift 140 miles long and from four to sixteen miles wide separating two sheer mile-high mountain ranges. All the colors of the rainbow are visible on the canyon walls. Pools of concentrated brine and fields of rough rock salt are found on the valley floor. More than 500 square miles of the valley are below sea



Photo by Auto Club of So. California

Top, building Death Valley's highway; right, crumbling office buildings and stores of ghost city of Rhyolite. Bottom, pool of brine at Badwater marks lowest point in western hemisphere

level and Badwater, 280 feet below sea level, is the lowest point in the western hemisphere. The valley is now a national monument administered by the National Park Service.

Tons of dates now are harvested each year on a ranch at Furnace Creek, Death Valley. Scotty lives in a fabulous million-dollar castle overlooking the northern end of the valley, resort hotels have been built at scenic spots and tourists swim in marble pools, explore side canyons on horseback and play golf on a grass course on the valley floor. Tourist camps and camping



places are available but all this civilization exists only from October to April. During the rest of the year the valley lies abandoned in the terrible heat.

Even today hardly a summer goes by without a few being caught in the desert and dying from heat and thirst. A flat tire or a radiator leak may bring on a tragedy. Temperatures as high as 134 degrees have been recorded in the shade of a standard thermometer shelter at Furnace Creek and it gets hotter still on the salt beds around Badwater. Men have burned their hands holding the steering wheels of closed cars on short drives. Walking more than a few blocks is almost impossible in the simmering atmosphere.

Death Valley, known as "ground afire" to the Indians, got its modern name when it was discovered by a party of people on the way to the gold fields in 1849. Several members of the party died in the region from lack of water although the desert was crossed during the winter. Heavy snow falls each winter on 11,000-foot-high Telescope peak that overlooks the valley but the average annual rainfall on the valley floor is only one and one-quarter inches.

(Continued to page 154A)



© Frashers



Vacationers now enjoy resort hotels, as at upper left, in what was once a valley of death. Above, picking dates at Furnace Creek ranch. Left, Pete Aguerreberry, famous old prospector, pans gold from his mine

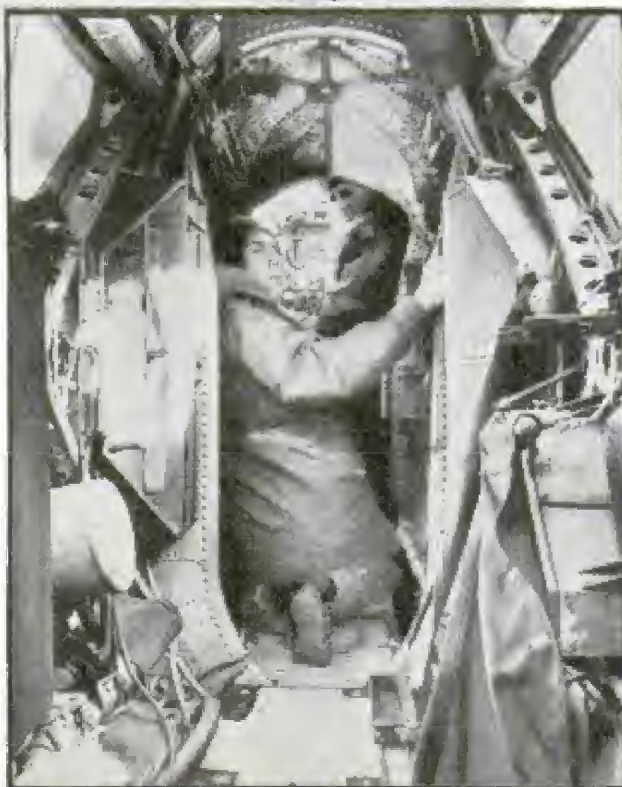
Long-Distance Planes Lift Twice Their Weight



Below, Britain's three "Wellesley" bombers on their 7,162-mile flight to Australia that set a new nonstop record. Left, the radio operator, and at bottom, an interior view looking forward toward cockpit



Ordinarily an airplane can carry a load amounting to a little less than its own empty weight. When the British "Wellesley" bombers hoisted away from an Egyptian field for their record-making nonstop flight of 7,162 miles to Australia they lifted nearly twice their own weight. Empty, a Vickers Wellesley weighs 6,520 pounds. On the takeoff at Ismailia, Egypt, the gross weight of each plane was over 18,300 pounds. The single-engined, low-wing monoplanes covered the seven thousand miles in forty-seven hours and five minutes. Each was manned by a crew of three—pilot, radio operator and mechanic. The planes are built on a construction scheme described as "geodetic," without bulkheads or spars in hull or wings; the structural loads are supported by a lattice-work of aluminum alloy tubes. The wing span is seventy-four feet, the length thirty-nine feet. The nine-cylinder, air-cooled



"Bristol Pegasus" radial engine of 900 horsepower turned a new type controllable-pitch propeller with wooden blades.

Cell Life Made to Stand Still by Quick-Freezing Process

By freezing small living organisms at terrific speed life is made to stand still in a latent state for thousands of years. According to Prof. Alexander Goetz, physicist of the California Institute of Technology and inventor of the new process, the secret

of halting animation lies in a method of extremely quick cooling, followed later by rapid thawing to bring again a state of normal life. Living organisms, at present limited to yeast cells and bacteria, are plunged quickly into liquid hydrogen hav-

Pasadena, Calif.

ing a temperature of minus 252 degrees centigrade, or about twenty-one degrees above absolute zero. Freezing takes place in one two-hundredth of a second which does not allow time for a change in the exact geometrical pattern of the cell's form. If frozen at a slower rate, the molecules in the cell could rearrange themselves and assume a crystalline form, forever losing life's characteristic pattern. In this new state of being, a minute of normal life can be stretched out over 10,000 years.

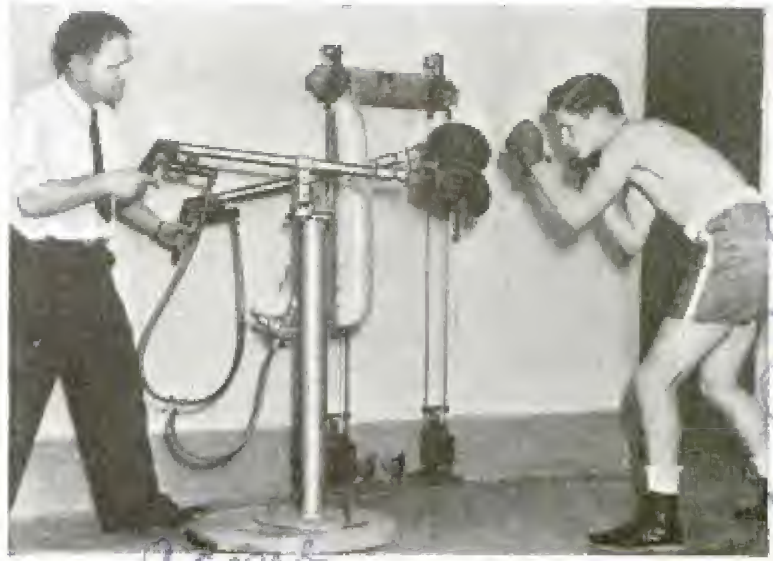
Tourist Tent in a Trailer Mounted on Casters

For the motor tourist who prefers tent life, a small trailer has been developed which forms a roomy camp home. It has sleeping and dining facilities, and the partly raised trailer top supports the front of the tent roof at a height affording plenty of head room for campers standing inside. The trailer has a double-arm coupler which can be attached to any automobile without wrenches or special tools, and, with its caster-type wheels, rides smoothly and can be parked and backed without trouble.



Double-arm coupler on this trailer, shown packed and with tent raised, is easily attached to any car

Boxer's Robot Sparring Mate Fights with Compressed Air



Compressed air is behind every blow this robot boxer strikes, and it takes quick dodging to evade its thrusts

Here's a sparring mate with plenty of punch, and one that can't be hurt. It is a two-fisted mechanical boxer built to teach footwork and alertness in dodging and blocking blows. The fighter tries to connect with a dummy, and meanwhile dodges the trigger-operated flying fists which are shot at him by compressed air.

Coffee Temperature Regulated by Heat Control Plug

Coffee can be kept at any desired temperature in an electric urn by means of a variable heat control plug. Built into the plug is a knob switch readily changed from high to low temperature. Although designed specifically for use with electric coffee makers, the plug can be used with many other appliances.



From the exhaust of automobiles in the United States comes 17,500,000,000 gallons of new water yearly, enough to fill a canal twenty-five feet wide and six feet deep from New York to San Francisco.

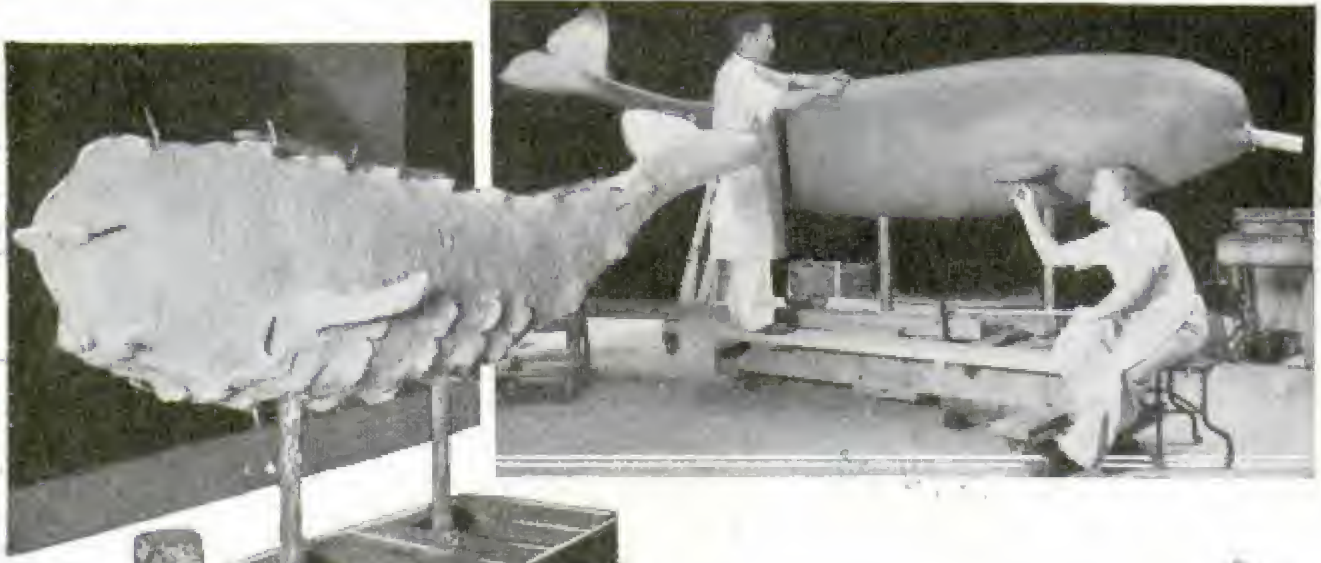
Diabiform Steel
Products Co.

General Motors Corp.
"Chemistry and Wheels"

Designed by Fred. Frederick
Westminster, C. Y. O. Summit
Siles, Springfield, Conn.
Hartford, Conn.

Success invented by -
Staff Taxidermist. Leon L. Walters.

Creatures Modeled to Appear Natural as Life

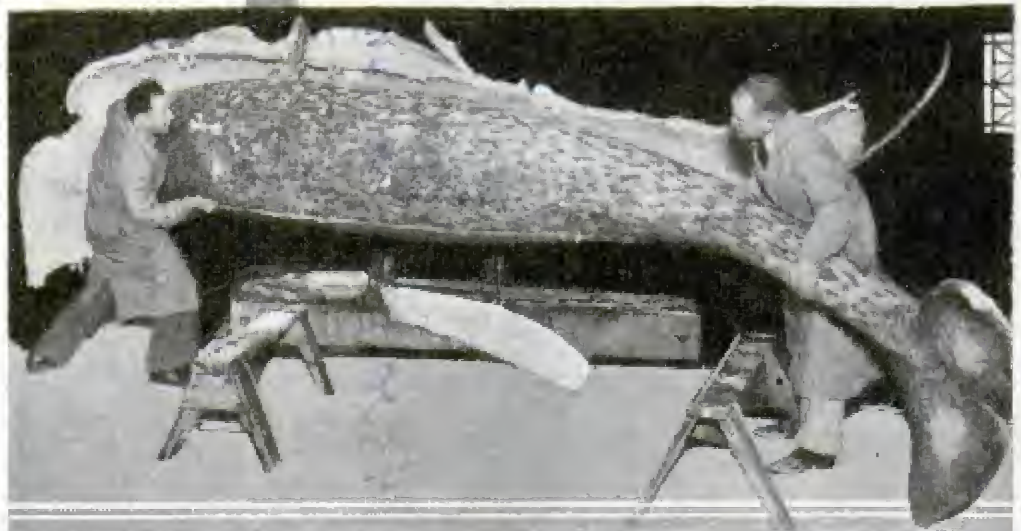


Here an arctic narwhal, close relative of the whale, is reproduced for Field Museum of Natural History. It begins with clay model, upper right; left, mold of plaster of paris is allowed to set over model, then removed a section at a time



Above, painting artificial "skin" of mammal inside plaster mold. Skin is a patented cellulose-acetate material. Left, wire-mesh and composition backing is applied to add structural strength, then sections of mold are fastened together

Strange synthetic creatures with skins of cellulose acetate—the material of which photographic film is made—are fashioned to appear as natural as life at the Field Museum of Natural History in Chicago. After sculpturing clay model and making plaster cast, taxidermists mix cellulose acetate with all colors and reproduce skin pattern over entire mold. Later, mold is soaked and broken away, right, leaving exact copy of original



Handwritten notes in the left margin:
 Comb. John W. Meyer. Staff Taxidermist. Success invented by -
Handwritten notes at the bottom:
 Success invented by -
 Staff Taxidermist. Leon L. Walters.

Risking Death to Build Man's Mightiest Work



When Grand Coulee dam is completed it will be man's mightiest structure, a monument to engineers and workmen who risked life every day on dizzy heights of its skeleton. Its 550-foot wall will back up a lake 151 miles long, nearly a mile wide, developing 2,520,000 horsepower and irrigating 1,200,000 acres. At left, top, workman attaches a line to compressed-air "main"; right, crane swings men over foamy water to base of dam. Bottom, latest view of dam, and welder on penstock

Acme

121392

Volvo Foundation
POPULAR MECHANICS

Balloon Train Takes Cosmic-Ray "Census"

Into the stratosphere by train went six pounds of delicate instruments recently. It

was a train of balloons, hauling a Cellophane-wrapped radio station that sent back signals from nearly fifteen miles above the earth. Six bags filled with hydrogen were tied together in a line 100 feet long and released from the roof of the Franklin Institute at Philadelphia. For two and one-half hours the research staff below received signals from which they could read the temperature and cosmic-ray density at the various altitude levels up to 78,000 feet.



Dr. Serge Raffo, Bartol Foundation

Top, six balloons ready to carry cosmic-ray instruments and radio transmitter to sub-stratosphere. Below, wrapping radio set in Cellophane bag



Mr. A. Remer, Franklin

12138
International Research Corp., Ann Arbor, Mich

Enlarger Focusing Made Easy by Microscope Easel

More accurate means of obtaining critical focus of photo enlargers is offered by a new framing easel. The device makes use of a microscope through which the actual grain of the emulsion is seen. When the grain of the film becomes sharply visible, the image is automatically brought into the most critical focus

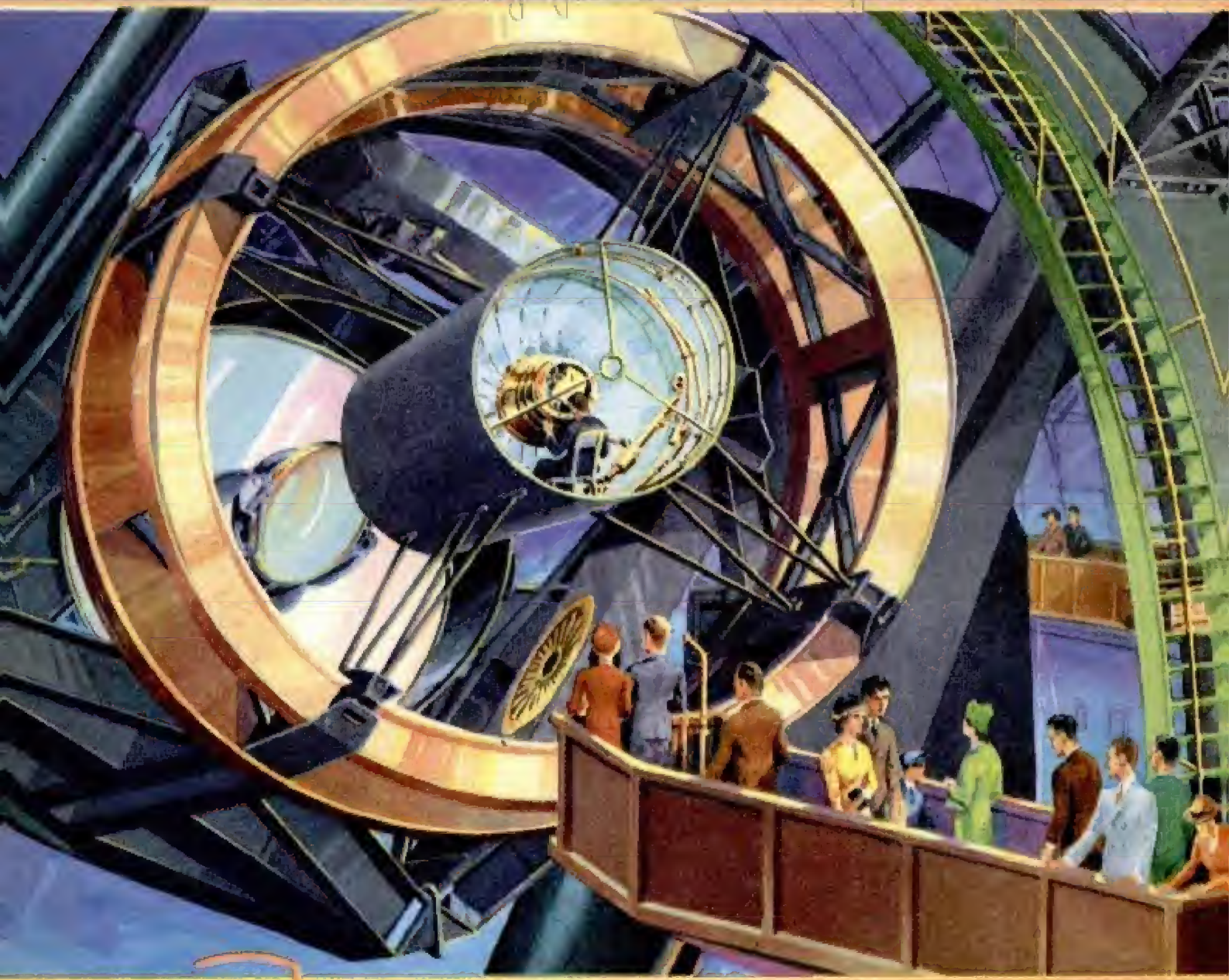


on the surface of the printing paper. The system gives the operator a control over the amount of grain that is to appear in the final print. Inasmuch as the actual grain of the film is in view when focusing, it is possible to defocus slightly until the grain has just about disappeared without any

great loss in print definition, actual sharpness of the image being unaffected. The easel, which is of metal construction, has quick adjusting paper stops which permit the border to be varied to any width.

12138

689
London, W.C. 2, England.
Modern Wonder. 5/28/38.
Story from S. Thompson.

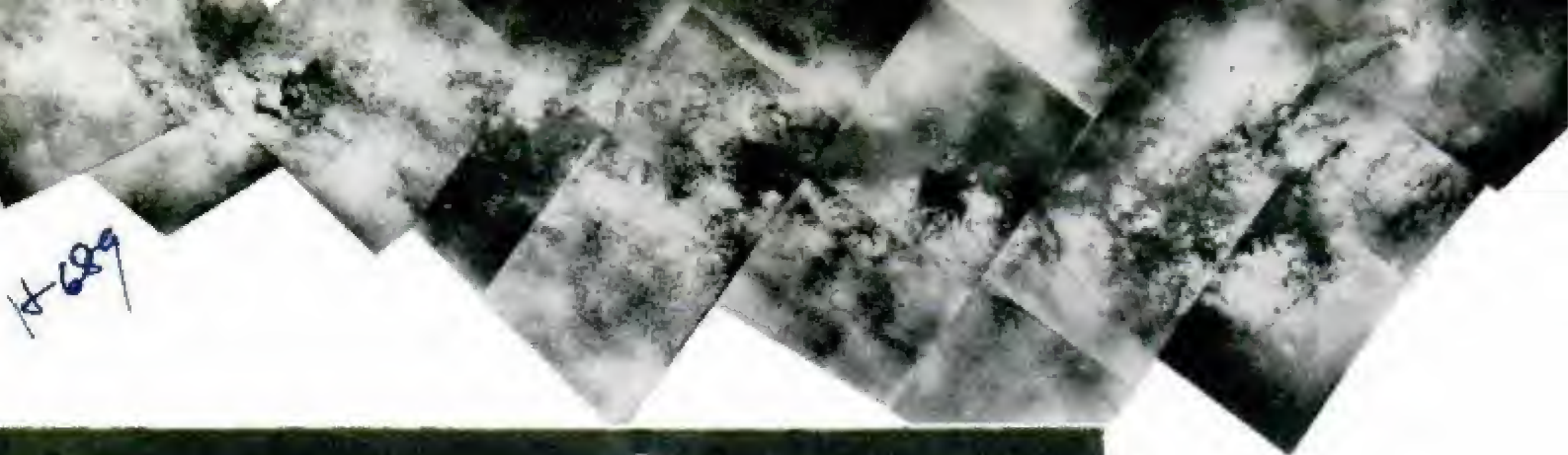


VISITORS on the "bridge" examine the mightiest
of all telescopes, Mt. Palomar's 200-inch eye.

177

The WONDERS of ASTRONOMY

Reference - Astro. Physics Dept.
California Institute of
Technology,
Pasadena Calif.



MOSAIC chart of Milky Way at top was photographed with six-inch lens. Astronomers expect to discover ten billion other star systems, each as large as the Milky Way, when the new mirror starts sweeping the skies. One-tenth the size of the giant telescope, the scale model at left is exact copy complete to electric drives and is itself an efficient instrument, already in use at Pasadena.

198
WITHIN a year the mightiest telescope ever dreamed of, a \$6,000,000 giant that "couldn't be built," will be sweeping the skies for new contributions to man's knowledge. The great 200-inch reflecting telescope of the California Institute of Technology will start its career late in 1939 or early in 1940, considerably ahead of schedule.

Today, completing touches are being put on the big steel dome, fourteen stories high, that will house the instrument on the top of Palomar Mountain, ninety miles southwest of Pasadena. The telescope itself, complete except for the

delicate optical parts, will be finished this winter.

Gathering four times as much light as the largest instrument existing today, the Palomar telescope will see twice as far as any other telescope in the world. It will have twice the focal length of the next largest telescope and will be used for studying objects in the sky too faint to be perceived by present instruments.

Astronomers expect that they will discover some ten thousand million star systems each the size of our Milky Way and that they will be able to push the borders of the known universe to one bil-

lion light-years away. A light-year is nearly six trillion miles, the distance that light travels during a year's time.

The heart of the new telescope will be the 200-inch concave mirror, actually 201 inches in diameter, which is now receiving its final polishing and figuring. Some two tons of glass have been ground away to achieve the curve in the surface and another handful of glass will be removed during the twelve months that the final polishing will require. The mirror surface will be polished to an accuracy of one millionth of

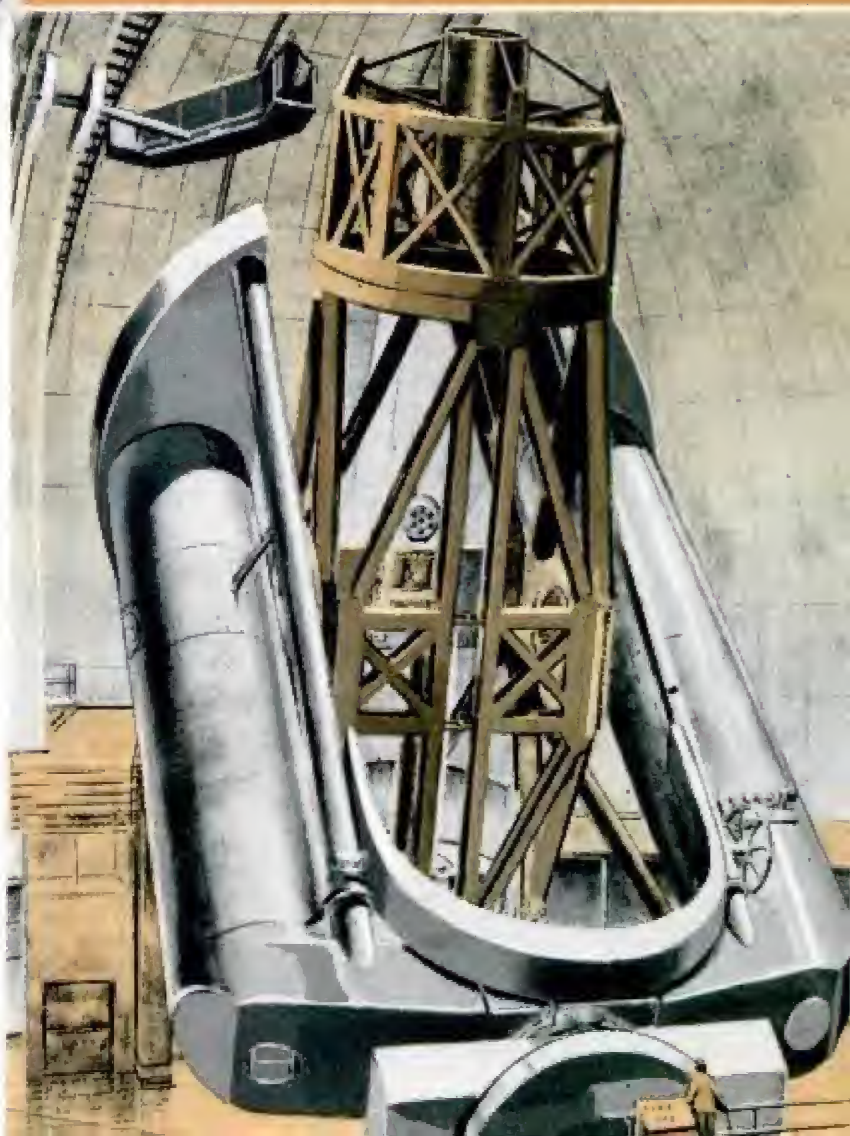


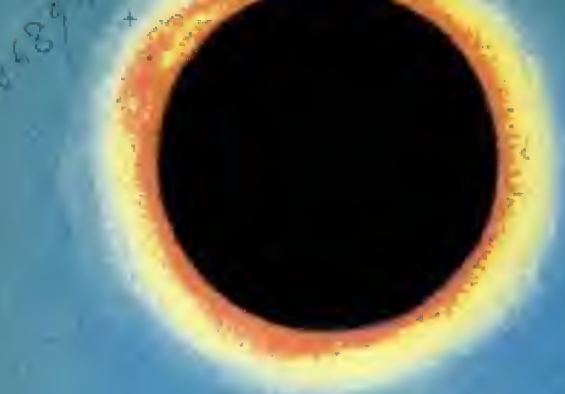
199
SPIRAL nebulae of Ursa Major, top, photographed by seven-and-one-half hour exposure. Above, studying spectral lines of stars to measure their elements. Below, under Mt. Palomar's dome,

an inch and a reflecting surface of aluminum, only a few molecules thick, will be deposited on the mirror in a special vacuum chamber.

This telescope will look like no other ever built and it will be far more versatile than most instruments. The new style of mounting permits it to cover the entire visible sky from the North Pole down to the southern horizon. Its optical parts can be hooked up in different ways to facilitate particular lines of research.

Direct observations, made by exposing photographic plates to the





Sun in eclipse, with vast flames of incandescent hydrogen gas sometimes rising a half million miles. In total eclipse, the sun is surrounded by a halo called the corona.

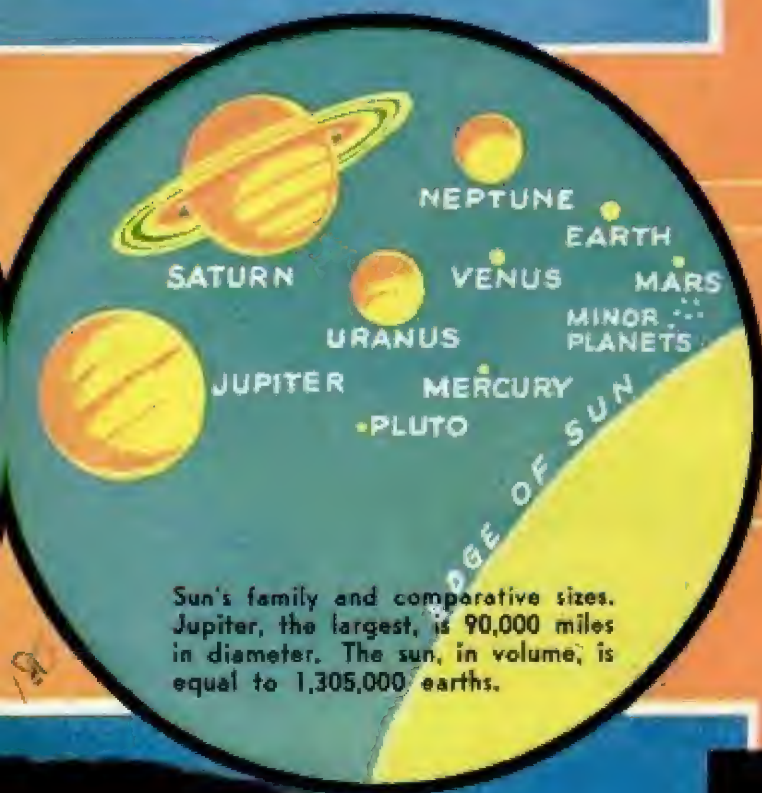
6 MINUTES EXPOSURE

15 MINUTES EXPOSURE

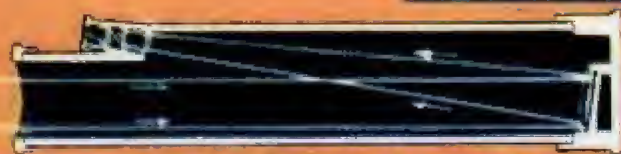
37½ MINUTES EXPOSURE

94 MINUTES EXPOSURE

Four pictures taken through sixty-inch telescope at Mt. Wilson Observatory, showing how extending the exposure time brings in more stars.



Sun's family and comparative sizes. Jupiter, the largest, is 90,000 miles in diameter. The sun, in volume, is equal to 1,305,000 earths.



Telescope invented by Sir William Herschel had a concave twenty-four inch mirror which was slightly tipped. Image was formed at eyepiece. Slanting mirror caused distortion and the instrument was abandoned.



In the Cassegrain telescope, rays from the object are caught by large concave mirror near eyepiece and reflected to small convex mirror, which reflects them through hole in mirror to observer's eyepiece.



Moon as seen through 100-inch telescope at Mt. Wilson observatory. Size of craters is shown by map of England drawn to same scale.



Eighteen-inch Schmidt telescope in use on Mt. Palomar, Calif., as an exploring telescope for finding mysterious super novae stars.

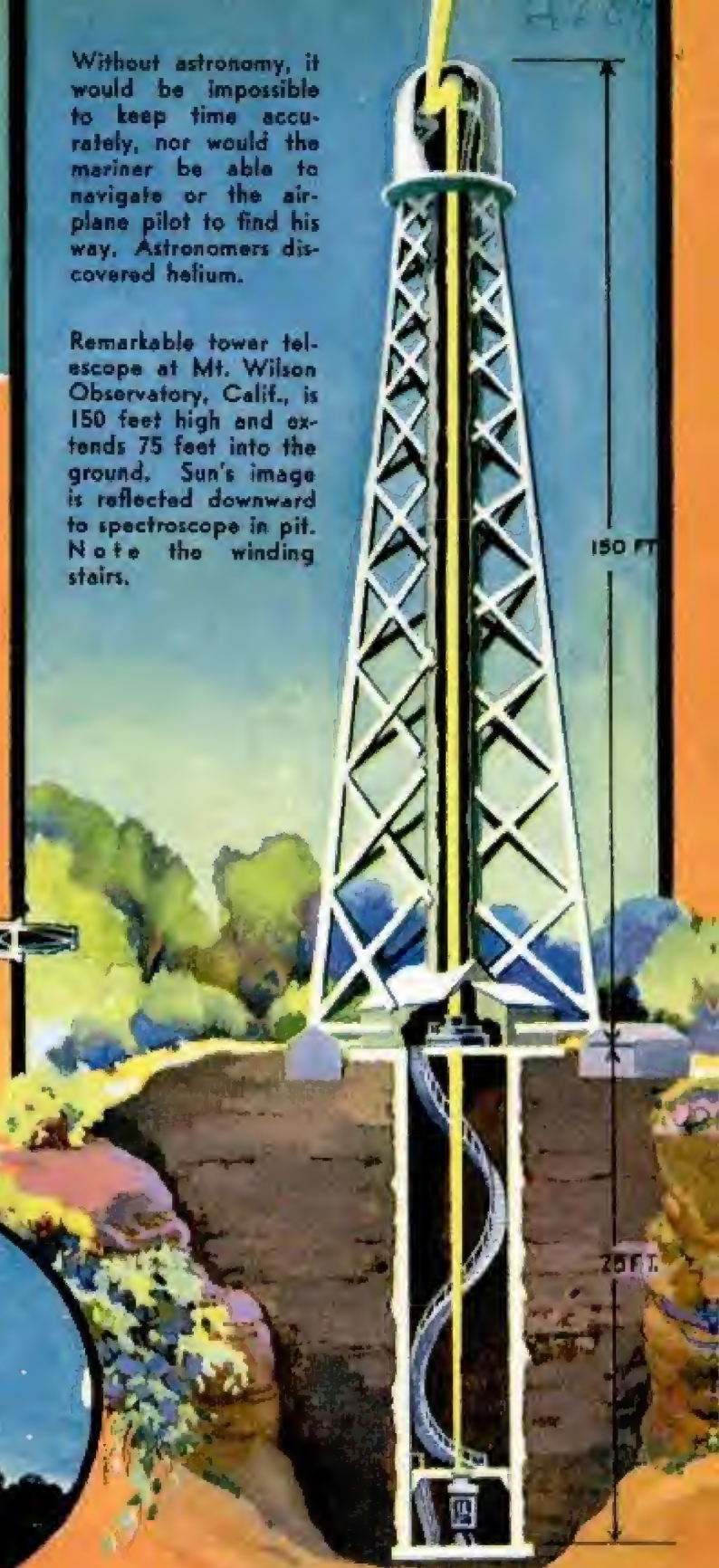
and 7,000 miles wide.

Strange white spot which was discovered on Saturn in 1933.

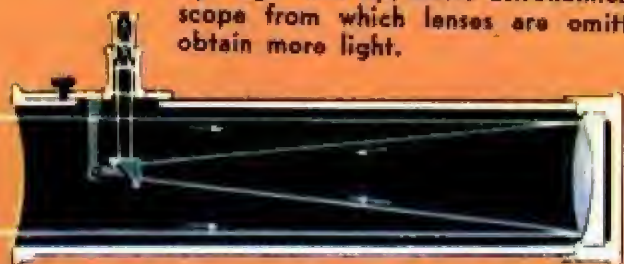


Without astronomy, it would be impossible to keep time accurately, nor would the mariner be able to navigate or the airplane pilot to find his way. Astronomers discovered helium.

Remarkable tower telescope at Mt. Wilson Observatory, Calif., is 150 feet high and extends 75 feet into the ground. Sun's image is reflected downward to spectroscope in pit. Note the winding stairs.



Ordinary terrestrial telescope presents image right side up, unlike astronomical telescope from which lenses are omitted to obtain more light.



Newton telescope in which rays are caught by concave mirror, reflected back to prism which then reflects them at right angles. Eyepiece is at side.



Gregorian telescope is like Cassegrainian except that image is reflected back to concave mirror instead of convex.



Visitors from space approaching the earth, with large meteor at bottom and comet at top right.

COATING OF ALUMINUM

11 FT RADIUS

16'8"

WEIGHT SAVING RECESSES

BASE PLATE

HOLE FOR EYE-PIECE

Largest piece of glass ever cast, 200-inch mirror for new telescope. It weighs twenty tons and smoothing its surface to one millionth of an inch will take two years.



New 200-inch telescope may reveal whether these are roads or canals on map of Mars drawn by the late Prof. P. Lowell.



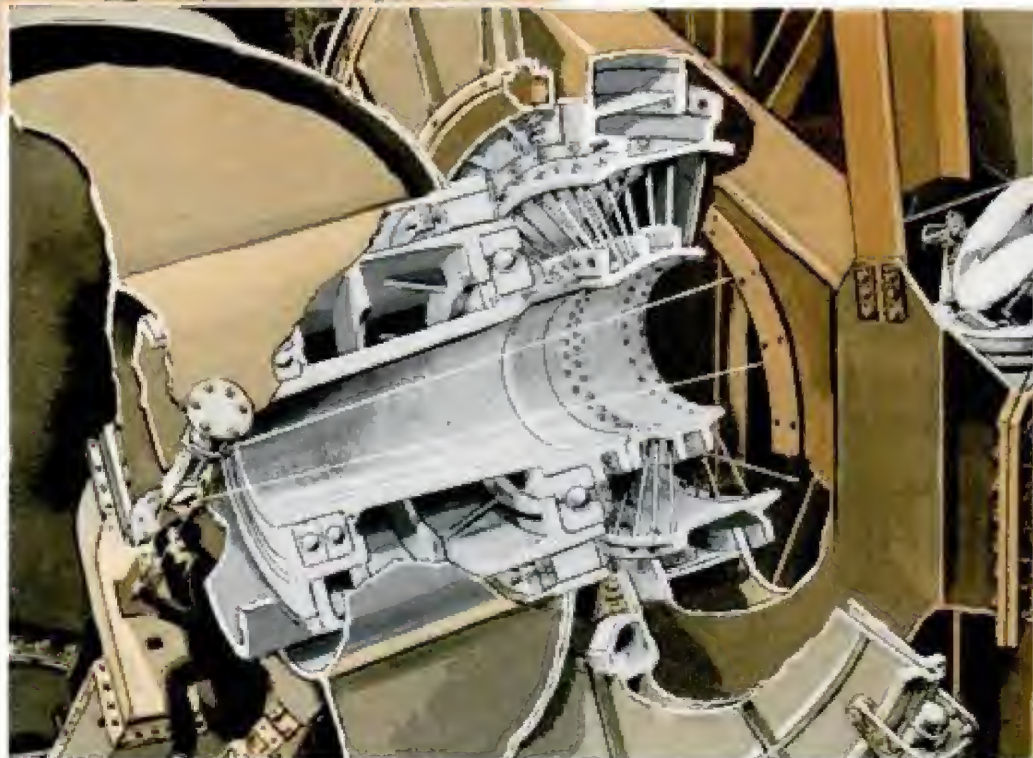
14684

FOURTEEN stories high, the two-million-pound dome is really a dome within a dome, each coated with aluminum and separated by a four-foot air space for insulation. It revolves on thirty-two four-wheel trucks of railroad type which roll on a track around the wall. Below, cutaway drawing of declination trunnion. Bottom, twelve exposures of Saturn made at Mt. Wilson observatory.

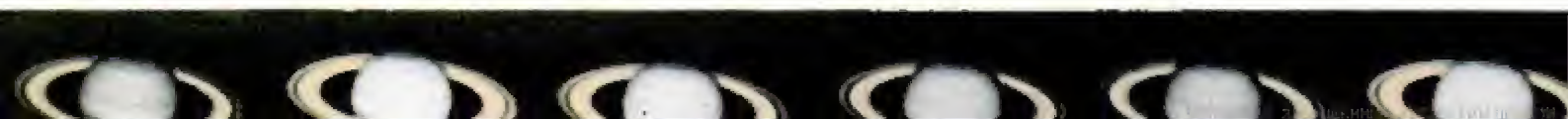
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concentrated light from the mirror, will be made at the prime focus, the point above the mirror where the reflected light is brought to a focus by the mirror's curve. The observer will be stationed inside a small bullet-shaped house suspended inside the skeleton barrel at that point. The house reduces the amount of starlight falling on the mirror down below but the astronomers estimate that this method will be more efficient than the diagonal mirror usually placed at the prime focus to reflect the rays out of the barrel to an observation point.

By substituting a mirror for the observer's cage at the prime focus and reflecting the gathered light back down through a hole in the center of the 200-inch mirror to an observation point below, a different optical effect is achieved. This Cassegranian focus will be used for



spectrographic and photographic observations. In still another hook-up, known as the coudé, the light is reflected from the prime focus back to a diagonal mirror suspended above the giant eye and is "piped" by several other mirrors to a constant temperature vault where special spectrographic work will be conducted. In this setup the light will be reflected from as many as five mirrors in the optical train. A jib crane, oper-

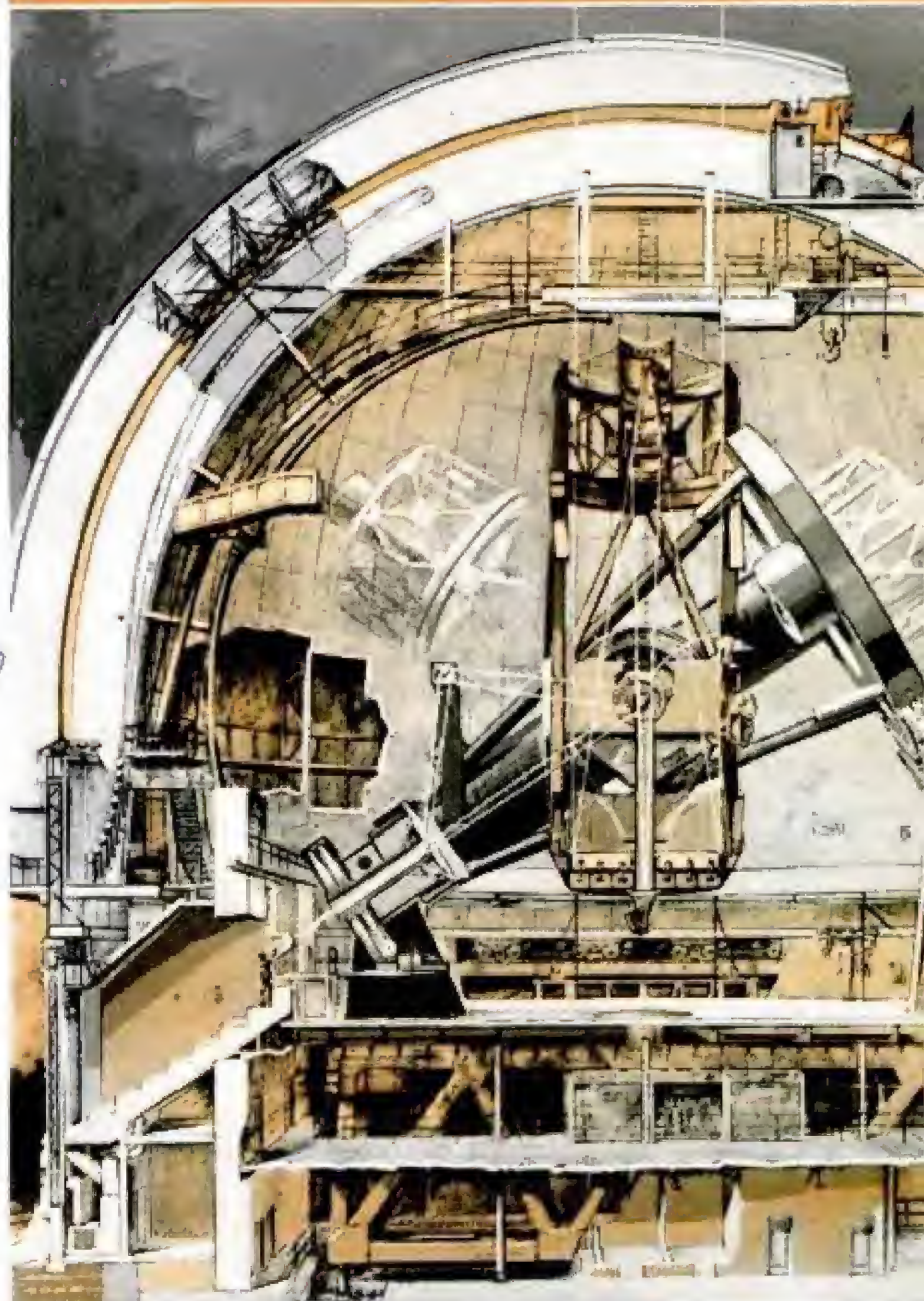
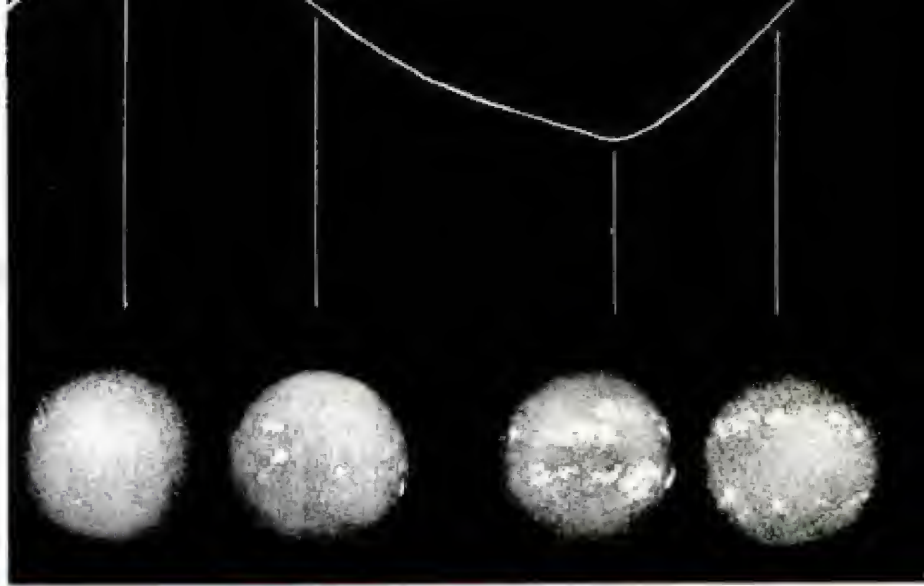


ated by electric motors, is being mounted on the great telescope for moving the optical parts.

Astronomers estimate that for many kinds of observations the telescope will be twice as powerful as was first planned simply because of the great improvements that have been made to auxiliary instruments since the telescope was first projected. Photoelectric equipment, correcting lenses, and the sensitivity of photographic emulsions all have been improved vastly, increasing the scope of all astronomical telescopes.

One of the great strides is a new superthermometer invented by Dr. John Strong of the Institute's astro-physics staff. This instrument, called a radiation pyrometer, resembles a small telescope and is equipped with rock-salt and quartz lenses that screen out all except infrared radiations. These red rays fall on two thin gold leaves attached to the wires of a tiny galvanometer. Aside from its astronomical importance the instrument can take the temperature of a person several miles away and measure the surface heat of clouds or balloons.

New ideas, new materials, and new methods were all necessary in building the titan of telescopes. Accuracies never before attempted on a large scale were imperative. Pointing the huge instrument on a star and holding the image still during the star's slow movement across the night sky is comparable to keeping a gun trained continuously on a target two inches in diameter that is eight miles away and that moves at a speed of three feet per second. To stay on the star the telescope must move on two axes at the same time and the great dome above it must also revolve so that the telescope always points through the open slot in the roof. The different



CURVE of single sun-spot cycle is shown at top with four calcium spectroheliograms showing appearance of sun at phases of cycle, observed at Mt. Wilson. Phantom drawing below gives impressive glimpse of immensity and intricacy of Mt. Palomar telescope.



14689

MIRROR, cell, support and cover are seen in cutaway drawing at left. Below, an astronomer inspects the small polished mirror which is used to reflect light from the stars to a spectrograph, where the scientist reads the thin spectral lines to learn the elements of which stars are made.

moving parts weigh hundreds of tons each and yet the slightest vibration would cancel the value of the telescope. For some kinds of research the image of a star, picked up by the great light-gathering eye, must pass through a slit one thousandth of an inch wide. Any vibration would throw the image off. Once, during an observation at another observatory, the vibration from a one and one-half-horsepower concrete mixer several blocks away was enough to disturb the instruments.

One of the most difficult feats was to arrange a smooth way of turning the big 2,000,000-pound dome. Even a slight vibration such as would barely ripple a glass of water would be too much. The problem was solved by a new type of drive developed by Edmund G. Grant, associate engineer of the project. The dome is supported by thirty-two four-wheeled railroad-type trucks that travel on a track around the circular wall. Instead of using the conventional rack and pinion to turn the dome Grant created a new kind of friction drive, using four electric motors of seven and one-half horsepower geared vertically to huge rubber-tired motor-truck wheels that press against the dome.

(Continued to page 128A)



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Vegetable "Sculptor" Makes Amusing Figures



Brooklyn
Talented ten-year-old Harold Brown, right, has developed an unusual hobby by assembling the ordinary run of vegetables, fruit and other items from the table into odd sport characters. Above, the big feet of this high-kicking football player are made of peanuts attached to string-bean legs; the body is made by carving a large potato, and stalks of celery swing at the sides to form arms



Above, with every muscle strained to win a sprint, the onion-head six-day bike rider points his spice nose into the wind; eyes made of cloves are wide open for every advantage, as the string-bean legs pedal away to drive wheels of orange slices. Left, with a carrot and string-bean body, and a celery tail, the horse watches his polo-player rider swing wickedly at a pea. The collection represents nearly every sport

1626 W 7 St

Clamp-On Light for Shop Is Handy for Repairman

Personality



At top, spotlight is clamped to pipe in workshop and focused on center of operations

Particularly useful for repair work where a steady light is required at different angles, a new clamp-on light is on the market. The clamp, of the rubber-covered spring type, clamps readily and quickly to almost any support. The light from the lamp is projected in a glareless, concentrated beam. A ball and socket swivel joint permits tilting in any direction, increasing its uses in shop or factory.

Vise Tapes and Binds Negatives to Make Lantern Slides



Acting as a vise, a new photographic aid tapes and binds miniature negatives into slides for projection. Ball-thrust bearings in each

jaw allow the slide to revolve freely when pressure is applied and the glasses remain in exact position as it turns, assuring neatly applied binding. The jaws are faced with

Warne and Carter

rubber to insure a firm grip on the slides. Being heavy and having a sponge-rubber base, the unit will not slip while in use.

St. Louis, Mo.

"Gearshift" Nut Cracker Fits on Wall Bracket

Made to fit in a kitchen wall bracket, a handy nut cracker is operated by a small lever resembling an automobile gearshift, with a knob grip. A shift of the lever cracks the shell neatly and the meat can be removed unbroken. The bracket is a standard one made to hold various tools.



Swinging Sun Dial Adjusted to Avoid Time Errors

Swinging in a vertical position, a new-type sun dial keeps more accurate time than the old-style stationary dial. The plane of the dial is adjusted by a notched arc designed to keep the stylus always at right angles with the sun at noon, thus reducing the margin of error common in horizontal dials during the various seasons.



Notched arc under swinging sun dial is used to correct seasonal errors common in horizontal dials

W. S. Brown, Salisbury, N.C.

Dist: Central Camera Co. 230 S. Wabash. Chicago

Brown Electric Co., Rochester, N.Y.

Wide World

Pistol Range Built in Tunnel under Back Yard

Shaped like a barrel, a fifty-foot target range built under the back yard permits shooting practice without disturbing the neighbors. Targets are carried through the tunnel on a wire and can be brought back to the basement by means of a pulley arrangement. The target is lighted at the end of the tunnel by reflected light. At twenty-five feet, midway of the tunnel, is another spot where targets may be placed. The range has electric fans to carry off smoke and fumes of burnt powder. A manhole in the yard permits access to the target end of the tunnel. Sound of gunfire is deadened by noise-absorbing material with which the basement is lined. A telescope at one side of the tunnel makes it possible for the gunner to check his shots. The tunnel range is used by Fred MacMurray, motion-picture actor.



© Paramount Pictures, Inc.
Top, Fred MacMurray, film star, starts fresh target to end of tunnel on carrier wire. Below, loading for target practice on underground range.

Manhole Lid Remains in Place Despite Sewer-Gas Blast

When two Springfield, Ohio, men read newspaper reports of a sewer-gas explosion that flipped manhole lids high in the air and killed several persons, they went to work on a safety lid. The result is a manhole cover that will let gas escape but cannot

be flipped off by explosion or dislodged by traffic. It consists of two hinged lids connected to a center beam, although without any actual hinge, the connection being similar to that of a wheel on an axle. The lids would fly open in event of an explosion, but immediately drop back in position. The center beam is dropped through notches in the manhole rim and then given a quarter turn to anchor it. Once the cover is locked in place it cannot be dislodged or tilted by wheel traffic.



Co. inventors: Martin Svendsen
and Frank L. Patterson

273 Delmar Road
Springfield, Ohio

Tapping DAVY JONES'



Lowering bottle for taking samples of deep-sea water. Left, "snapper" sampler with jaws which close automatically and bite out sample when bottom is touched



TREMENDOUS fortunes in undeveloped mineral wealth lie at the bottom of the sea and today the world is beginning to consider ways of extracting these hidden treasures. Natural deposits of phosphates, oils and other minerals that are buried under the oceans probably would be worth billions of dollars if they could be recovered.

Mining the bottom of the sea today is receiving close scientific study. "It is very probable that in the next generation a great deal of wealth will be taken from the sea bottom," says Dr. Francis P. Shepard of the University of Illinois, one of the sub-sea explorers. "Difficulties that seemed insurmountable before are being overcome. Oil wells off both the California and Gulf coasts are already extracting thousands of barrels of oil at sea."

The present off-shore wells, tapping underground pools that extend past beach lines, were drilled in shallow water or protected lagoons. Surveys indicate that the oil resources of Texas and Louisiana probably extend 100 miles out to sea. More than forty salt domes, along the sides of which large quantities of oil are commonly found, have been charted on the sea bottom in that area in depths of 200 feet of water or more. Most of these salt domes

TREASURE CHEST

are found at the edge of the continental shelf, from the Mississippi delta to the Mexican border. There are likewise possible submarine oil pools off the west coast of the United States, and areas considered worth exploring extend as far as 150 miles to sea in water depths up to 500 feet.

Petroleum engineers think it feasible with our present knowledge to drill for oil two or three miles off

Current meter for measuring velocity and direction of deep-sea currents. Bottom, sediment trap which catches matter drifted along by sub-sea currents



shore although costs might be considerably more than drilling on land. As deep-sea drilling technique improves wells might be drilled at much greater distances from shore, with pipe lines laid along the bottom of the ocean to the wells. One suggestion for drilling is that it could be done from barges moored to minimize wave motion. Present drill pipe is quite flexible and arrangements could be made to seal the work so it could be left safely during storm periods.

The shallow Malay seas are adjacent to oil territory, there may be vast oil possibilities in the wide submarine shelf off the north and east coasts of Siberia and salt domes have been charted in the shallow Persian gulf. One complication that might arise is the question of ownership of undersea resources, the high seas until now having been regarded as outside the jurisdiction of any country although interna-



Examining sections of ten-foot core of sea-bottom samples. Right, relief map showing contours of submarine canyon off California coast near La Jolla. Contours at upper part represent hills ashore

tional fishing treaties usually concede a country a prior interest in adjacent waters.

So far oil seems to be the most promising undersea treasure although evidence of other deposits has been found. Great masses of rock phosphate lie off Pacific coast beaches in depths of from 300 to 4,000 feet, some of which might be recovered by enormous dredges.

Gold dust has been reported in samples of the sea bottom taken from deep Alaskan fiords and there is the possibility that great deposits of placer gold may lie in the submarine canyons off the coast of California. Such deposits, if they exist, would be found concentrated in small areas due to the natural sorting action of the canyon currents. Fine placer gold frequently is found on California and Oregon beaches after winter storms.

Three-quarters of the world's surface lies under water and has never been explored adequately. One-tenth of this area consists of shoal continental shelves and

shallow seas covered with 600 feet of water or less. It is these shallow areas that have exploitation possibilities. Scientists formerly supposed the continental shelves were mere accumulations of debris swept off the continents by erosion. But, using "snappers" for bringing up samples of the bottom, and dredges for hoisting larger pieces, investigators are learning that the continental shelves are integral parts of the continents. As such they are likely to contain veins of valuable ores.

Today sub-sea scientists are exploring canyons more spectacular than the Grand Canyon, ancient lakes buried under a mile of water and

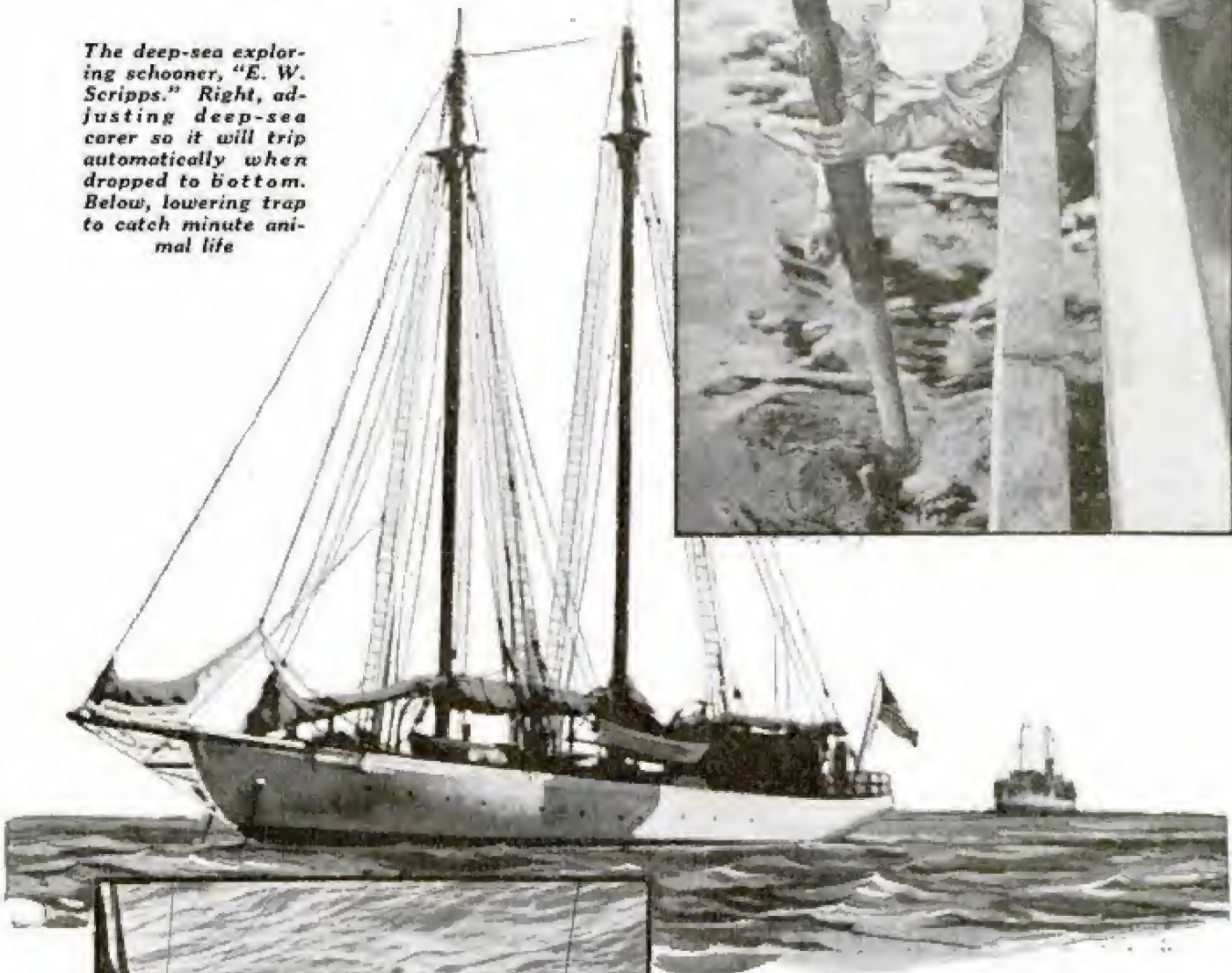


submarine volcanoes that may or may not still be active. During the last year, Dr. Shepard, with the cooperation of the Geological Society of America and the Scripps Institute of Oceanography at La Jolla, has been exploring the continental "borderland" off southern California. From the deck of the sturdy exploration schooner, "E. W. Scripps," he has surveyed the greatest known gorge in the world, a submarine canyon one wall of which rises 7,000 feet

above its floor and which extends for more than seventy miles to sea off Monterey. This great canyon has nearly twice the height and length of the vast rift 100 miles off the coast of New York which was surveyed a few years ago.

There are fifty or more such submarine canyons along the west coast, most of them characterized by steep walls, winding beds and tributary branches that suggest they were once natural river channels at a time when the sea's level was much lower than at present. Typical river gravels have been

The deep-sea exploring schooner, "E. W. Scripps." Right, adjusting deep-sea corer so it will trip automatically when dropped to bottom. Below, lowering trap to catch minute animal life



dredged up from the bottoms. Last summer Dr. Shepard reported a tremendous landslide in a submarine canyon off La Jolla. Being adjacent to the research laboratories, the walls of this canyon are checked by soundings every two months, and one set of soundings revealed that at one point the canyon cross section had changed since the last soundings, large

(Continued to page 147A)

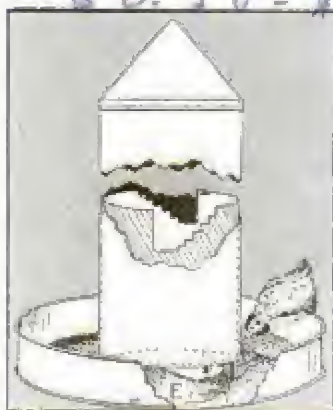
Clock Opens Dog's Lunch When Owner Is Absent



After patiently watching the clock, the pup is rewarded when the "alarm" opens the lunch bowl at six

Your dog can have his dinner right on the dot even if you don't come home until late. An automatic feeding pan that opens at any hour set on an alarm clock lets the pup eat at the proper time. Dogs quickly learn to be on hand when the lid pops open.

Non-Waste Poultry Feeder Is Adjustable, Sanitary

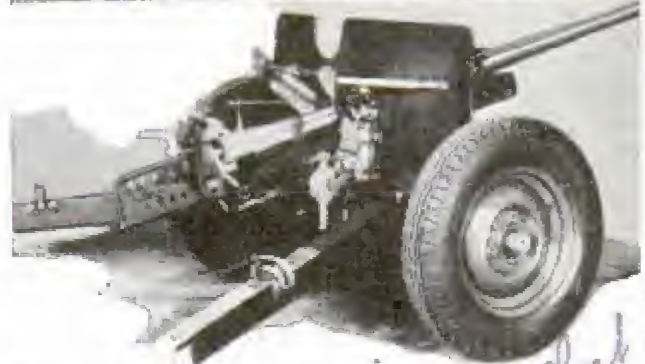
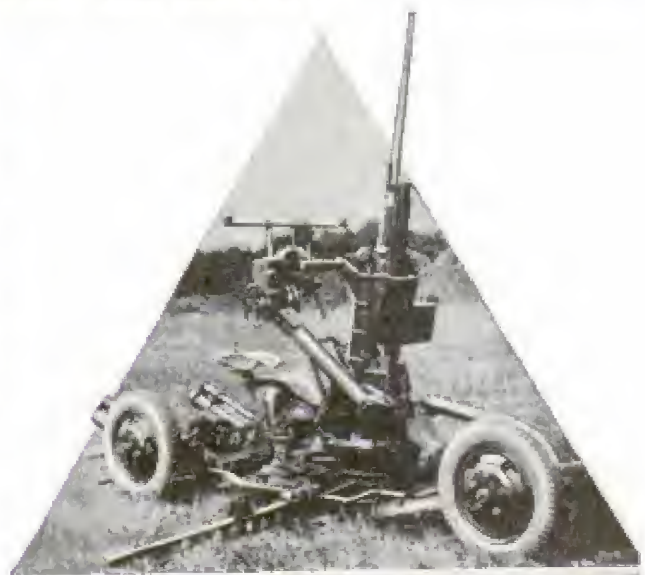


Made of galvanized steel, a self-feeder for poultry prevents waste. Flow of feed into the trough may be regulated, more coming down from a storage compartment as that in the trough is eaten. The feeder

is designed to keep the poultry from sitting on the edge of the trough, resulting in better sanitation. The feeder is made in two sizes. One model serves twenty-five to thirty hens at a time and the other has a capacity of 125 to 175 hens.

Army's Latest Deadly Weapons Fight Tanks and Planes

Two new and highly effective weapons, one designed to combat aircraft and the other to fight tanks, have been adopted by the U. S. Army. The anti-aircraft gun is a thirty-seven-millimeter, automatic weapon, mounted on an all-around fire, four-wheel trailer which may be towed by a light truck at high speed. The unit has a wheelbase of 120 inches, with a fifty-eight-inch tread. It weighs 5,000 pounds. The anti-tank gun, of the same caliber, is mounted on a carriage capable of being towed behind fast trucks or being hauled short distances by man power. The gun crew is protected by armor. In action, one member of the crew loads the gun and the other aims and fires it.



Top, automatic anti-aircraft gun; below, anti-tank gun with armor protection for its two-man crew

Tractor on Two Giant Wheels Pulls Scraper

Mounted on two driving wheels which have pneumatic tires six feet eight inches high, a new tractor combines with a scraper to form an excavating machine for use on flood-control and dam-building projects. The tractor is powered by a Diesel motor developing 160 horsepower. Also mounted on two wheels, the scraper has a heaped-load capacity of thirty-eight cubic yards. Coupled together, the two vehicles form a forty-foot unit. The combination machine is speeding up operations on Hansen dam in California.



Above, the two-wheeled power unit. Note that the tires are man-size. Left, tractor hooked to a two-wheeled scraper, forming a forty-foot earth-working unit. The scraper has a capacity of thirty-eight cubic yards of dirt and it is useful in flood-control and dam-building operations. A Diesel engine develops 160 horsepower to drive the unit



"Eyebrows" for Planes Speed Recovery from Stalling

Designed to aid in recovery from stalling and spinning, "eyebrow slots" are being installed on training planes at Randolph Field, the "West Point of the Air." The slot is a fixed installation on the leading edge of the wing. It causes a smooth flow of air to pass over the ailerons at slow speed, resulting in faster recovery from stalls and spins.



Pilot pointing to "eyebrow slot," a new safety device used on training plane to speed up recovery from stalling and spinning

There are 37,666,666 radio-receiving sets in the United States, 290 for every 1,000 population.

High M. Beville
Chief Plasterer
Capt. Roger M. Ramey
H. M. Foster
Rockefeller Plaza

Trapping FISH PIRATES



A fast patrol plane flying low over salmon traps. If the pilot decides those in the near-by boats are fish pirates, he notifies the authorities and the freebooters are usually caught before they can get away in their slow boats. Left, hand hauling a fish-trap lift net full of salmon.

A SLEEK blue monoplane flashed westward under the broken clouds of an Alaskan sky. Her pilot, Capt. Ansel C. Eckmann, scanned the glimmering water below as he pressed the right rudder bar to give a wide berth to the lofty peaks that rise sheer from the shore of Chichagoff island.

Ahead and around a tree-studded promontory, a heavy cannery tender plodded eastward, a group of light-hearted fisher-

men clustered around the wheel on the pilothouse roof. They laughed and joked, shouting to make themselves heard above the deep throb of the gasoline engine.

It was July 3, and they were heading for Juneau to celebrate the Fourth. Their fish traps, scattered for miles in isolated coves, had been deserted for the duration of the festivities.

Presently the plane rounded the point and Capt. Eckmann's sharp eyes spotted

41126
Captain Eckmann may be reached at Orcas Island, Wash.

from the AIR



Lifting the silver horde from the trap to a scow for the ride to the cannery.

the surface boat. The plane's elevators lowered and the ship zoomed down to the cannery tender. Skimming so low over the water that the pontoons nearly touched, Capt. Eckmann's mechanic, Frank Hatcher, slid open a window and hurled a corked bottle into the water a few feet from the fishing boat.

The tender stopped and hands callused from hauling heavy fish nets scooped the bottle aboard. The cork was removed and a paper fluttered to the deck.

"Return to your traps," the note ordered. "The fish pirates are planning a big haul

over the Fourth. All leaves of absence are cancelled." The order bore the signature of the fishermen's superior.

The cannery tender swung about, pointing her bow westward. Rifles were broken out and loadings inspected. The fishermen were on their way back to guard their traps and their valuable catches of salmon.

Capt. Eckmann's plane was miles away within a few moments, dropping a similar message to another cannery tender. Then another and another until every crew was turned back.

This was ten years ago and the event



The Alaska fish traps attracted a new type of buccaneer from the hordes of men who followed the golden rainbow north in 1898 and were disappointed at not finding the beaches heaped with the precious metal. But they found something that paid nearly as well, and much easier to get—the silver horde that swam the cold waters of the Pacific ocean.

Thousands of the gold seekers turned to the fishing grounds to wrest fortunes from the millions of salmon which each year return to their birth streams to spawn and die.



marked the introduction of fast seaplanes to combat freebooters as gay and impudent as those ancients who pillaged the high-sterned galleons of Spain on the Caribbean sea. Almost overnight the fish thieves learned that the reckless genius by which they had looted salmon packers of hundreds of thousands of dollars annually could not cope with these darting patrol ships that swooped from behind mountains and clouds.

Salmon in Alaska are almost as liquid a medium of exchange as gold, silver or currency. They can be traded for supplies and services, or sold for cash-over-the-dock at any of the scores of canneries. Salmon can't be branded like an Oklahoma bull. All salmon look alike and possession is as valid as a warranty deed filed in the county courthouse. The man who delivers the fish to the cannery is the man who takes the cash.



Top, tender bringing scow of salmon to cannery. Center, one of salmon patrol planes. Bottom, an Alaska glacier from the air, the daily sight of flyers who patrol the salmon grounds

The fishermen spread seines, trolled and erected traps, selling their catches to the many canneries that sprang up quickly.

Traps are long rows of piling, extending sometimes a quarter of a mile from shore in channels where the salmon schools swim. Twine or wire nets are hung from them to trap the fish as they enter. One of the strangest characteristics of the salmon

(Continued to page 114A)

Built-In Bumps 'Torture' Autos on Test Track

Automobiles are subjected to real torture on a new body-twisting stretch of test track at the Ford Motor company. The track, made of concrete, has mounds six inches high and as wide as the automobile. These mounds are staggered, one on one side of the track and another on the other. When a car is driven over the track on either side, the wheels pass over only one mound at the time. Another test calls for the car's right front wheel to pass over a mound at the same time that its left rear wheel goes over the mound on the other side of the track, thus subjecting the body to a wracking twist. The punishment is all the more severe when the car is given the test at twenty to twenty-five miles per hour. So hard is the car



Auto "hitting the high spots" while being given a body-twisting test on new track. Note humps in the pavement

shaken that a test driver must fight to retain control. After several runs up and down the track, the car is taken to the laboratory and its body, springs, steering apparatus and other parts are examined carefully for signs of damage or failure.

Tiny Planets Move Around Midget Sun on Electric Model

Complete almost to the smallest detail, a model planetarium demonstrates the solar system when a button is pressed, the tiny planets moving in accurate paths about a midget sun.

by a red light bulb, in exactly the relative time it takes the real planets to make a revolution. Every sixteen minutes, representing a year of 365 days, the "earth" around the sun. An



Electrically operated model of solar system. Tiny balls on top represent sun, moon, earth, Mercury and Venus

moon to make one revolution about the miniature earth. At all times, the midget earth holds its relative position to the sun, while the moon and Venus vary from the horizontal plane in their proper movements. Earth and moon, on the model, are constructed to a scale of one-eighth of an inch to 1,000 miles, making the earth fifteen-sixteenths inch in diameter. Thirty-two gears, each with the correct number of teeth carefully computed, move the planets.

Conk. Evan A. Cohen 1950 2

20th, Indianapolis

Wingfield Medicine
112 Elm St.
Madison, Wis.
Directly

Tin Horseman and Steed Made by Soldering



This unusual figure of a tin horseman decorates the front of a Minnesota shop

Standard tin parts have been soldered to make the figures of a tin horse and rider that decorate the front of a Minnesota tin-smith's shop. The horse and rider are both depicted in lifelike pose, lending an artistic touch to the advertising device.

Gas-Saving Changes in Engines Suggested to Car Makers

Slight changes in automobile engines that would make them more economical have been suggested to the automotive industry by A. J. Blackwood, C. B. Kass and O. G. Lewis of the Standard Oil Development company. These changes would reduce the octane rating of the gasoline used in the automobile, thus resulting in a saving. Reduction in the variations of distributor-cam contours, which determine when the fuel in each cylinder is fired, and reduction of the variation of the fuel and air mixture from cylinder to cylinder would make this possible. Some experts recommend that manufacturing practices should result in a decrease of several points in octane-number requirement (of the fuel),

which in turn could be utilized in future designs to permit of higher compression ratio and increased efficiency. A study on a typical engine reveals that there is wide variation in the mixture being fed to the different cylinders and in the timing of the ignition spark, with resultant detonation in some cylinders and an increase in the octane number of the fuel to make the entire engine operate well. Fuel octane number requirements vary from cylinder to cylinder and the engine as a whole needs the highest rated fuel required by the poorest functioning cylinder.

H 1346

Dual Grinder for Lawn Mower Whets without Dismantling

Both the rotating blades and the stationary knife of a lawn mower can be sharpened by a power grinder which does its work without dismantling the mower. It takes but a few minutes to clamp the mower in position, perfectly aligned for grinding. The reel blades are sharpened to the proper cutting clearance with relation to the stationary blade.



Once the mower is clamped in position, this grinder sharpens both stationary and reel blades

Rogers Manufacturing
Lansing, MI

Tests on Street Speed Coming of Television

DUE to mechanical difficulties, such as the laying of expensive cables for transmission, and to the lack of some means of paying for programs, television is not yet ready for general use in this country. But extensive experiments, aimed at improvement of apparatus, are being conducted in New York, and elsewhere, with such good results that an entirely satisfactory performance may be expected when television is introduced on a large scale. Since the transmission of pictures of news events as they happen will be an important feature of television, tests include work with a portable outfit. The iconoscope camera is trained on some person or object and the transmitter flashes pictures of the scene to receivers before which sit engineers to view the finished product and to suggest means for improvement. Just recently the portable unit caught pictures of a new model automobile arriving at the curb and discharging passengers. The unit transmitted the scene to a receiving set high up in a building near by, with what engineers described as satisfactory results. While the television pictures seen on the screen of the receiving set were not nearly as distinct as photographs of the same scene, they were clear enough for identification of persons within reasonable distance of the iconoscope camera.



Iconoscope camera (top) being trained on automobile (center). Bottom, same scene on receiving set. Comparison with regular photo at center shows how far television has advanced in this country

Harnessing AMERICA'S Wildest



One of the switchboards in the control room at Boulder dam from which the flow of power is regulated



FOR generations the raging Colorado, rushing through its mile-deep canyons, enjoyed the evil distinction of being America's most unruly river. In the spring it descended on fertile desert lowlands as a roaring torrent. In the summer when this parched soil cried out for water, the surly stream dwindled to a sluggish creek.

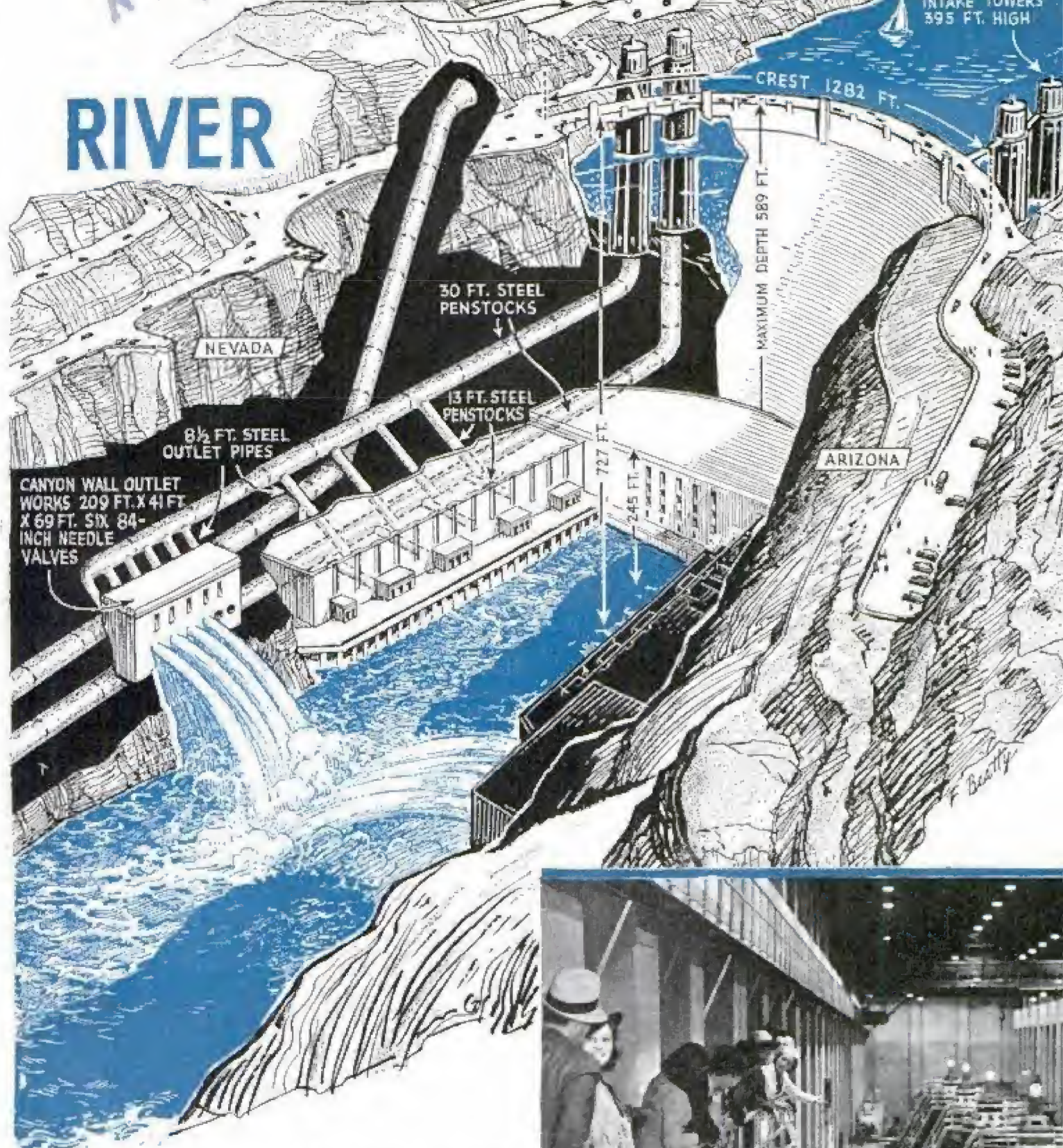
Today this renegade among rivers has been tamed. Imprisoned behind the massive concrete and steel wall of Boulder dam, the once ungovernable stream has become so docile that its former wasteful and destructive energy has been harnessed to do monumental tasks—to turn the wheels of industry hundreds of miles distant, to augment the water supply of the Los Angeles metropolitan area and to irrigate the rich farmlands along the river below the dam and in the Imperial valley.

In fact, so thoroughly has the Colorado been conquered that the puny hands of a few score of men, backed by the mighty strength of the dam, now direct the almost limitless force of this 1,700-mile river and control the flow of billions of gallons of water almost as easily as you control the flow of water at your kitchen faucet.



In the kitchen you turn a little valve and a jet of water under a few pounds pressure gushes out. At Boulder dam there are more than 21,500,000 pounds of gates and valves, a few weighing as much as 500,000 pounds. Opening such valves releases a veritable Niagara under pressures of hundreds or even thousands of pounds. Yet little more effort is required to open a

RIVER



valve weighing several tons than is needed to turn the steering wheel of your car, because the water does most of the work. In fact, operating some of the valves and gates requires no manual effort at all. They work automatically.

The nerve center from which the flow of water for all purposes is directed is the water master's office. No water will ever flow over this dam. Instead it is carried through huge steel penstocks from eight and one-half to thirty feet in diameter. The water enters through gates in each of



Some of the huge Boulder dam generators and, above, drawing showing how Nevada side of Boulder dam works. The Arizona side has a similar layout



four 375-foot intake towers above the dam, the tower gates being operated from a control tower in each unit although they can be closed in an emergency from the water master's office.

Through thirty-foot penstocks the water passes to smaller penstocks leading to the turbines in the powerhouse below the dam or, by operating needle valves, the water master's office can divert the flow through an outlet works emptying into the river below the dam. If, for example, an order is received from the Yuma project office which

collects the orders from each project along the river, for 10,000 cubic feet of water per second for irrigation purposes, and 7,500 cubic feet per second is being used by the turbines, the other 2,500 cubic feet is made up by releasing that amount through the outlet works.

When the reservoir above the dam is filled in another year or so, excess water can be diverted through two monster spillways, one on each side of the dam and each large enough to accommodate a battleship. These spillways, 650 feet long, 150 feet wide and 170 feet deep, empty into tunnels



Top, aerial view of dam and one of the great intake towers. Bottom, main power control room and, right, 9,000 cubic feet of water per second pouring from Arizona outlet works



Photo courtesy

Transcontinental & Western Air, Inc.

Boating on upper end of Lake Mead. Right, one of the Boulder dam penstocks. Bottom, operating needle valve in canyon wall outlet works

fifty feet in diameter and 2,200 feet long. Steel gates atop the spillways can be set to operate automatically and in an emergency will rise sixteen feet, adding that much to the crest of the reservoir in case of a serious flood.

Should a big enough flood occur, more than 500,000 cubic feet of water per second could be emptied through spillways, valves and power plants. If both spillways were to discharge at their capacity of 200,000 cubic feet per second each, the energy of the falling water would be about 25,000,000 horsepower, and the flow over each spillway would be about the same as the flow over Niagara Falls, but the total drop would be more than three times as great! It is expected, however, that the flow of water through all outlets can be limited to a maximum of 75,000 cubic feet per second.

The fact that only a handful of men are required to operate a project as huge as Boulder dam is all the more remarkable when the





Top, tiled corridor inside the dam itself and a night view of the dam. Bottom, water pouring from the canyon wall outlet works drops 180 feet—thirteen feet more than Niagara

size of the dam and the volume of water it holds in check are fully realized. This dam, 727 feet high, 660 feet thick at the bottom and forty-five feet at the top, contains enough concrete to build a monument 100 feet square and more than two miles high, plus more than 50,000,000 pounds of reinforcing steel bars and rails.

With one sturdy shoulder against the

Arizona wall of Black canyon and the other pressing into the Nevada side, it holds in leash a larger volume of water than is contained in Lake Erie. Lake Mead, the reservoir above the dam and the largest man-made lake, is more than 100 miles long, has a maximum depth of nearly 600 feet, a maximum width of eight miles and covers more than 145,000 acres.

Eventually there will be enough water in this lake in the middle of an arid desert to supply every person on earth with 5,000 gallons. So heavy is this tremendous volume of water that it has "dented" the surface of the earth above the dam and it exerts a maximum pressure at the base of the dam of 45,000 pounds per square foot. Yet man controls its flow almost to the gallon by opening and closing the valves and gates which form a part of the dam.

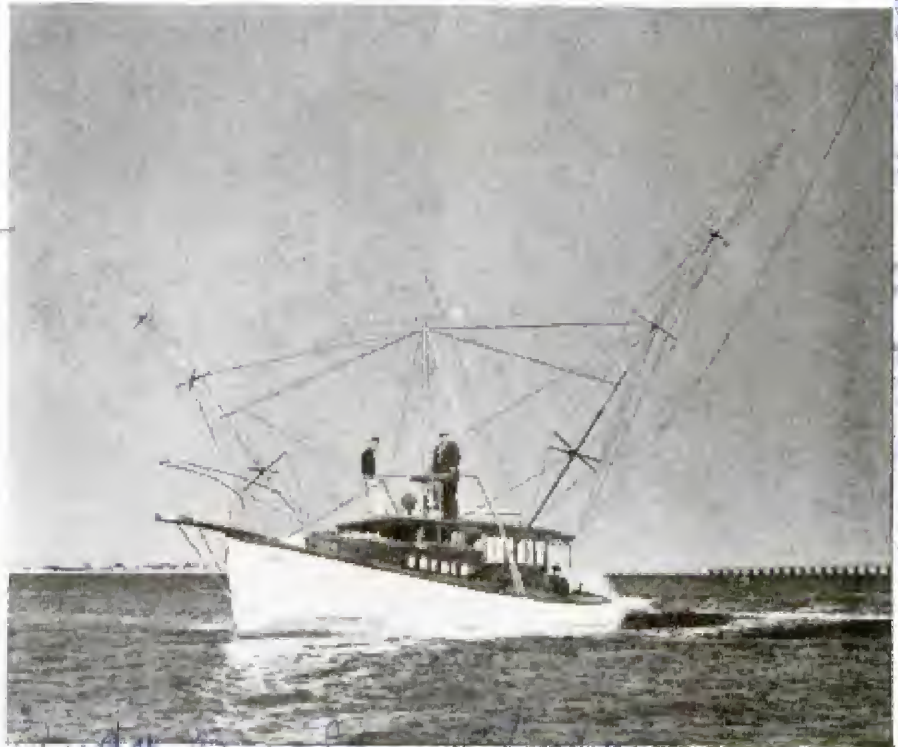
Nestled at the toe of the dam is a U-shaped structure which is dwarfed by the great wall above it. This is the powerhouse which is as tall as a twenty-story building, each wing being 650 feet long. In this building are the great turbines and generators which produce the electric power for Los Angeles and other districts hundreds of miles distant. Eventually there will be installed in this structure fifteen 115,000-horsepower and two 55,000-horsepower vertical hydraulic turbines, a

(Continued to page 118A)

Radio Antenna Strung on Fishing Outriggers

By stringing his radio antennas on the fishing outriggers, a Long Island yachtsman more than doubled his reception range. The forty-foot sport cruiser "Julieanna," of Freeport, L. I., is equipped with a single-frequency radio telephone set which normally has a range of sixty or seventy miles. When the fishing outriggers are spread out, and the antennas strung on them the telephone has a 150-mile range.

Radio telephone on this fishing boat has 150-mile range when its outriggers are spread to carry the antennas



Automatic Auto Top Is Put Up or Down by Pushbutton

When you push a button on the dash of one new model automobile, the convertible top flies up or down, as you desire. Vacuum power operates the top. The rapidity

of raising or lowering the canvas seems almost magical when it is remembered that car tops of only a short time ago required the combined efforts of driver and passengers to get them up or down.



Cameraman catches top folding as driver operates control on the instrument panel

Rayon Spun 800 Times Faster by Whirling "Bakelite" Reels

It used to take ninety hours to put molasses-like viscose through the various processing baths that transformed it into rayon. Today a new plant at Painesville, O., is being equipped to do the same job in six and one-half minutes. The secret of this speed is a patented spinning reel. These reels, resembling big talking-machine records, actually are cylindrical groups of Bakelite fingers that coil and uncoil the viscose strands and drop them downward at 200 feet a minute through baths to the driers and bobbins which wind the threads for the weaver. Pressure ejectors start the tiny streams of viscose on their way from the top. Speeding the manufacture of rayon 800 times faster than the traditional method, the continuous-spinning process is expected to do for rayon what the continuous-strip mill has done for steel manufacture.

Plymouth Corp.
Plano Corp.

Industrial Rayon

126
Golden Gate International Exposition
585 Bush St. San Francisco, Calif.

TREASURE ISLAND



Wonders of Golden Gate International Exposition, located on Treasure Island in San Francisco bay, include a rocket-gun thrill ride (right). Riders will have illusion of leaving the earth at terrific speed



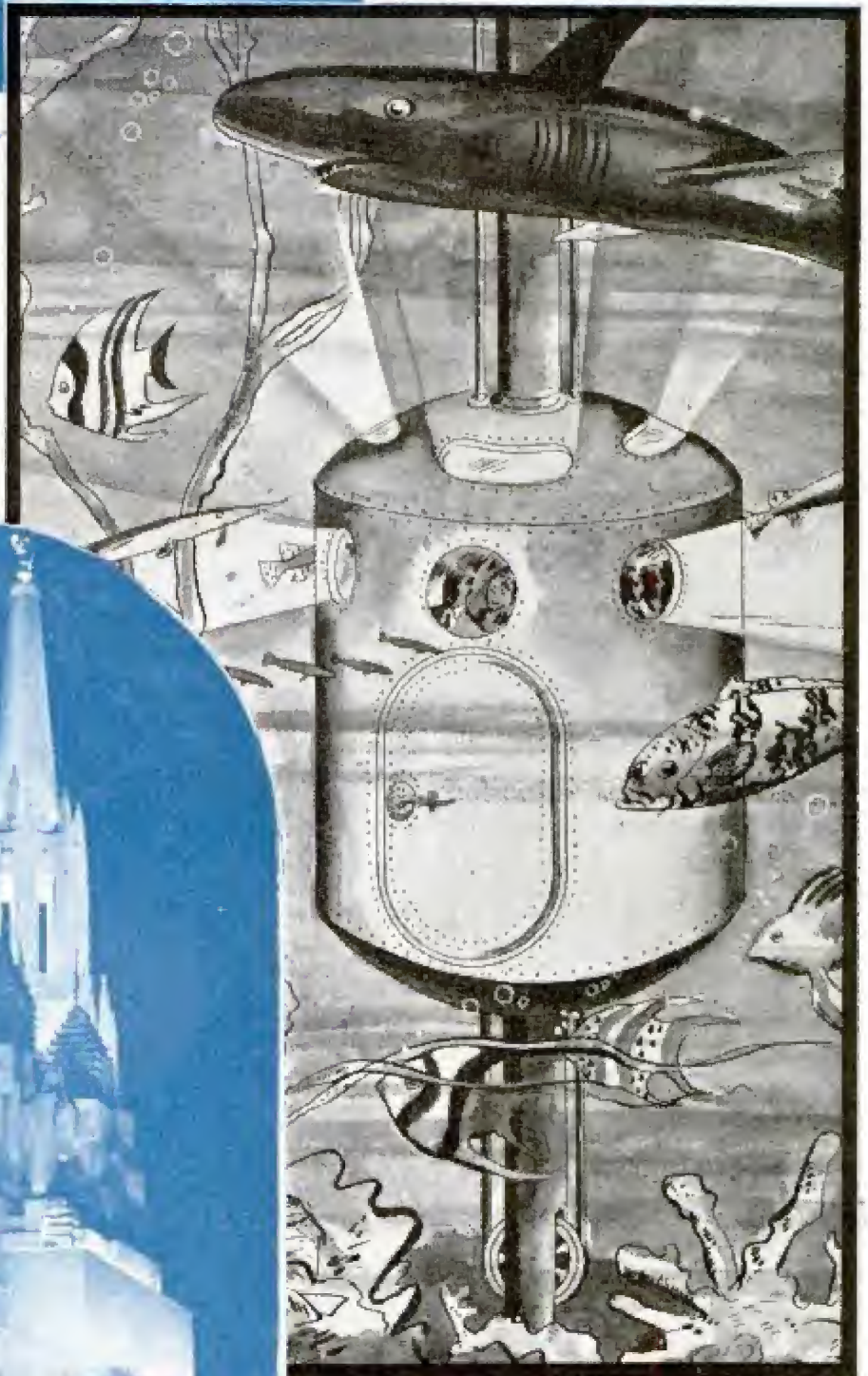
Left, view of 250-passenger compartment of rocket-gun ride. The "ship" is ninety feet long, equipped with portholes through which passengers apparently will see the earth receding. Below, 400-foot "Tower of The Sun" (center of photo), flanked by the main exhibit palaces



THRILLERS

Edmund
S. Martin

Right, another wonder of the exposition will be a steel diving bell which will take visitors into forty feet of shark-infested water. Operated vertically on a steel shaft, the bell will hold ten to fourteen passengers. The illusion of descent to great depths will be obtained through the use of a submarine garden. Built in a salt-water tank, the bell will be forced to the bottom under pressure. Release of pressure will allow the bell to bob to the landing pier on the surface.



Left, night view of the "Tower of The Sun" in preliminary tests of \$1,000,000 illumination equipment. Spectacular lighting will make Treasure Island appear as a magic city floating in San Francisco bay. Treasure Island is 5,520 feet long, 3,400 feet wide and stands thirteen feet above sea level. It is located just north of Yerba Buena island, which is midpoint of the \$77,000,000 San Francisco-Oakland Bay bridge. The bridge gives access to the exposition by motor. The exposition is built in the form of a walled city, with a new "Pacific" type of architecture blending old Mayan, Incan, Malayan and Cambodian forms.

Camera Catches Big Fish Leaping from Water

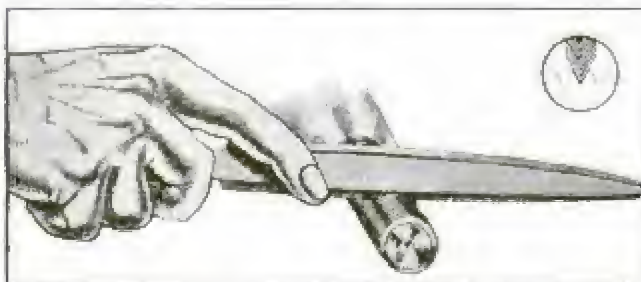


Unusual photo of hooked fish leaping in the air caught by alert cameraman

When a hooked fish leaped from the water off Ocracoke island, N. C., recently, it jumped right into focus of a camera near by. The surprised photographer pushed the button and caught an unusual picture. The fish was a cabio, a rare salt-water fighter that usually jumps clear of the water after being hooked. It was landed after a battle of almost an hour.

Two-Edged Rethreading File Fits All Standard Threads

Two sharp, tapered edges of a steel file for repairing threads are made to fit all



Repairing damaged threads with the double-edged steel file which cuts the standard sixty-degree angle

standard threads exactly. Coarse or fine, standard threads all have the same sixty-degree angle. The double-edge file is handy for cleaning out dirty, mashed and tight-fitting threads.

Landing Net Weighs the Fish as It Comes from Water

Enabling the fisherman to weigh his catch as it is taken from the water, a new landing net has a built-in scale. A standard spring scale set into the handle of the net functions by means of a release catch operated by the hand that holds the net. The net is made of strong linen mesh and is supported by a metal frame.



Non-Tipping Food Dish for Baby Has Suction-Cup Feet



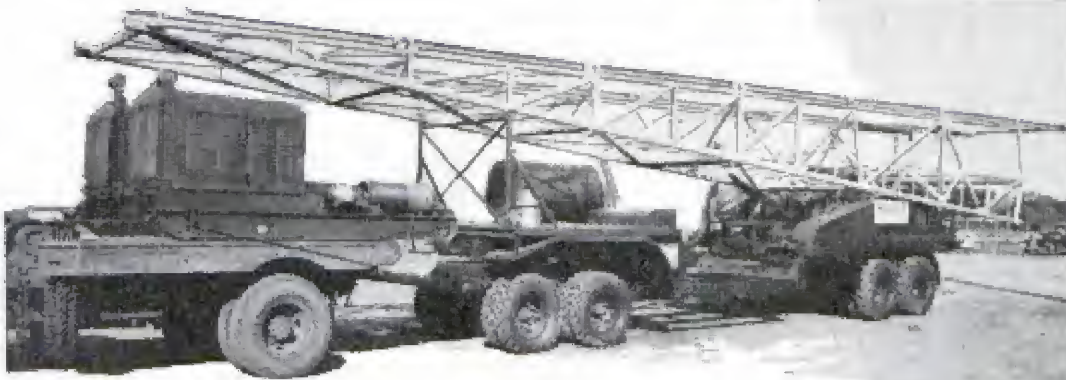
Held fast by suction cups, this dish cannot be overturned by children

Held firmly in place by three rubber suction cups, a non-tipping food dish for baby will adhere to any smooth surface. The dish cannot be upset. It is manufactured in bright pastel shades of pink, green and red plastic. The suction-cup feet are replaceable at small cost.

Penick-Medlevaine
Inc., 16 Hudson St.

Walbridge & Co.
Pensacola Bldg.

Portable Oil Drill Mounted on Rubber Tires



Top, the sixteen-wheel trailer carrying folded derrick to oil-well site. Right, portable drilling outfit set up ready for work

Self-contained and powered by two Diesel motors, a portable oil-well drilling outfit mounted on sixteen large pneumatic-tired wheels is now in use. Of the rotary type, the unit can drill 6,000 feet, at the rate of about 100 feet in twenty-four hours. When the unit is to be moved to another drill site, its derrick folds. The derrick will stack 5,000 feet of three and one-half inch drill pipe. Rotary drills of this type not only drill faster and deeper than the older "standard" type, but make it possible to take a sample core of earth at any depth, to show what formations are being encountered.



One-Man Cab on Shovel Truck Lets Boom Swing Clear



Notice the single-seat cab on this truck. It is made narrow so that the shovel boom can swing without interference

Mounted on a truck with a specially built cab, a shovel or crane can be transported easily to the job. A lightweight mounting makes it possible to install the shovel permanently on the truck, and its one-man cab leaves plenty of room for the boom to clear as it swings to dump its load. The shovel is gasoline-operated and has a seventy-five gallon tank alongside the driver's compartment.

Popular Mechanics Magazine can furnish the name and address of the maker of, or dealer in, any article described in its pages. If you wish this information, write to the Bureau of Information, inclosing return postage.

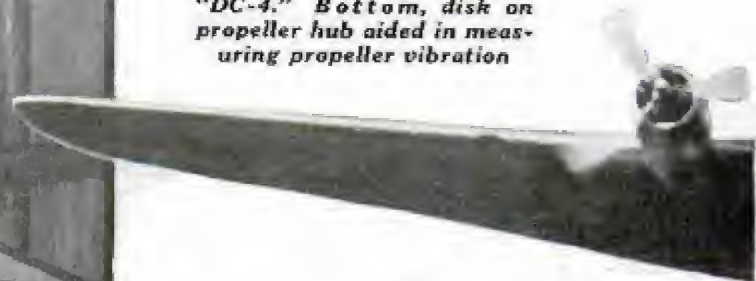
Hanson for excavator
Works 224 Michigan

Clawson Blvd.
149 Broadway
New York



CHECK

Adjusting mechanism which produced artificial "air-quakes" on tail surfaces of "DC-4." Bottom, disk on propeller hub aided in measuring propeller vibration



There is nothing spectacular, dashing or heroic about test-flying a new airplane, at least there isn't if the test crew knows its business. In fact, truth compels the blushing admission that the average test flight in the "DC-4" is about as exciting as a game of solitaire. That's the whole idea of testing—to make it a prosaic business, to put the ship through its paces

safely, to go the limit without taking chances.

Someone once described an engineer as a highly trained man who has to have everything proved to him. The test pilot does the proving. But if the engineer wants to determine the stalling characteristics of a new plane, the test pilot doesn't take the ship aloft, point her nose up and await de-

By Benny Howard

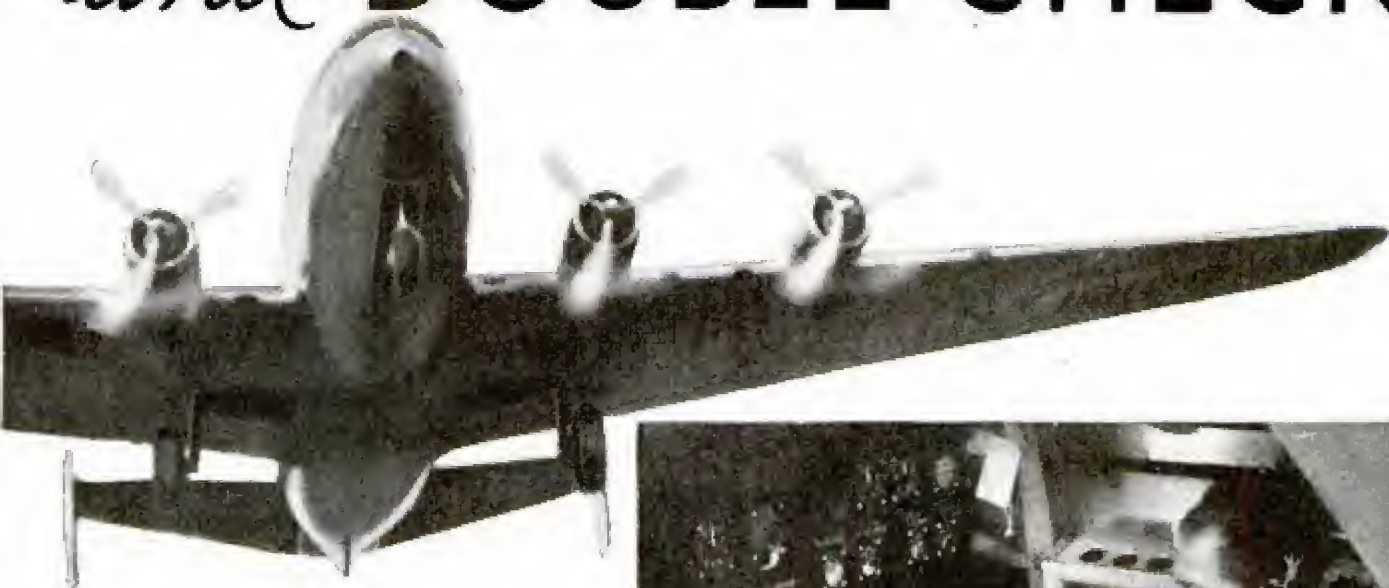
Research Test Pilot, United Air Lines

A TEST pilot, most people seem to think, is a foolhardy fellow destined to live a short but exciting life, a reckless chap who whisks an unproved plane into the sky and zips, zooms, rolls, dives, slips, spins and stalls in an earnest effort to dislodge an engine or snap a wing. If he succeeds, according to popular belief, he abandons ship, parachutes blithely down and then loafs until someone builds another airplane for him to murder.

This conception of a test pilot's job, I am happy to report, is just about 100 per cent wrong. United Air Lines which I represent in the tests of the largest land plane ever built on this continent was not looking for a stunt man. If I went up in the Douglas "DC-4" which represents an investment to date of almost two million dollars and the combined engineering of Douglas, United, TWA, American, Eastern and Pan American air lines, and started any impromptu aerial acrobatics, another pilot with no flying circus leanings soon would sit at the controls of this forty-two passenger, 65,000-pound sky liner.



and DOUBLE-CHECK



velopments. He finds out in advance what will happen by sneaking up on the stall.

He bides his time. He waits until weather conditions are right. He finds out what the ship will do under each condition leading up to a stall. He is patient, slow, cautious, methodical, perhaps to the engineer he seems just a bit stupid. But when he finally stalls the ship, he knows exactly what it is going to do. He has crept up on his objective by taking a step at a time and testing his footing with each



Two views of the great Douglas "DC-4" whose four motors develop 5,600 horsepower and, center, engineers reading instruments and recording data in cabin during flight tests



our destination the proving ground in the sky. There are a score of engineers and observers aboard. With me in the cockpit is a flight engineer, a pilot for the Douglas company and another representing the Civil Aeronautics Authority. In the cabin engineers and observers sit on comfortable benches in front of large desks containing amazing arrays of instruments. An engineering chart has been prepared outlining every test for the flight, and even the position of each observer. All of us are equipped with parachutes.

As we thunder down the runway to the hum of

cautious step. Thus he executes a potentially dangerous maneuver without taking chances. That's test flying—a patient, methodical approach to each problem, taking nothing for granted, never accepting the obvious until it's proved.

Few realize the tremendous amount of data which must be obtained, the hundreds of performance figures which must be checked and correlated in testing a new plane such as the "DC-4." While in the test stage, this sky liner is actually a huge flying laboratory, its cabin filled with more than 2,000 pounds of test instruments and 6,000 pounds of wooden framework, seats and boxes for housing the crew, the scores of instruments and the ballast. The instruments in this winged technical institute record everything from the fuel required to take off to the temperature of the brake linings during a landing.

Let's make a typical test flight,



Pilot's compartment of "DC-4" filled with flight and test instruments and, above, engineer in cabin watching "movies" of propeller vibrations during test flight



5,600 horsepower developed by the four engines. the flight engineer speaks rapidly into a dictating machine, recording his impression of the takeoff as he watches the dials and gauges. The ship's inter-phone system also connects the flight engineer with the pilots and with the engineers and observers in the cabin so data can be correlated as rapidly as it is gathered. During the progress of the flight, this engineer at my elbow continues to dictate so that when the trip is finished we have a complete record of everything which has occurred. This is important because everything that occurs on a test flight may be significant and nothing must be forgotten or we may have to do the entire test again.

Back in the cabin engineers and observers watch tons of instruments as they blink and whirl their thrilling story. Engine performance, the electrical system—big enough to illuminate an office building—the hydraulic system, vibrations and deflections in structural members—all are being checked and double-checked. On blueprint blanks, the engineers make detailed notes as the ship speeds high above the clouds. Engine pressures and temperatures, for example, require blanks with 110 lines, each of which must be filled out carefully during a flight. If just one person slips up and fails to get his share of the



The author peering from cockpit of the "DC-4" and, above, engineers at their stations in the cabin during a test flight

data, we may have to do the whole thing over.

After each flight, all the results are checked and transcribed. Eventually thick volumes of reports thus are accumulated, adding valuable information to the science of aeronautics. In this manner engine temperatures, on the ground and in the air,

(Continued to page 129A)

Enlarger Is a Film Viewer and Retouching Stand



Top, inserting paper for enlarging; below, using ground-glass window for viewing strip of film

Four purposes are served by a photo printer designed for the miniature-camera enthusiast. It will make contact prints of any size negative up to three and one-fourth by four and one-fourth inches, and will enlarge to that maximum size a thirty-five millimeter or half vest-pocket negative. The printing method is simple. There is a slot for the film, and a ground-glass platen for centering. Closing the ground-glass door turns on the light and exposes the paper. The glass door also serves as a retouching stand and film viewer.

Maybe You're a One-Eyed Driver and Don't Even Know It

In every hundred automobile drivers there are one or two who are completely blind in one eye. But three Yale investi-

gators report that twenty to forty drivers in every hundred have defective vision in one eye that handicaps them in driving—and these are especially dangerous on the road because they are ignorant of the danger. Once these drivers can be made aware of their deficient sight, they can be taught to drive with their heads at an angle or to keep turning from side to side to make the best use of the good eye.

Light Built in Battery Tester Makes Scale Easy to Read

Pressing the rubber bulb of the latest battery tester causes a built-in light to illuminate the scale, making it easy to read. A check valve prevents acid from dripping on the clothing, allowing it to run into the barrel where it is kept until released.



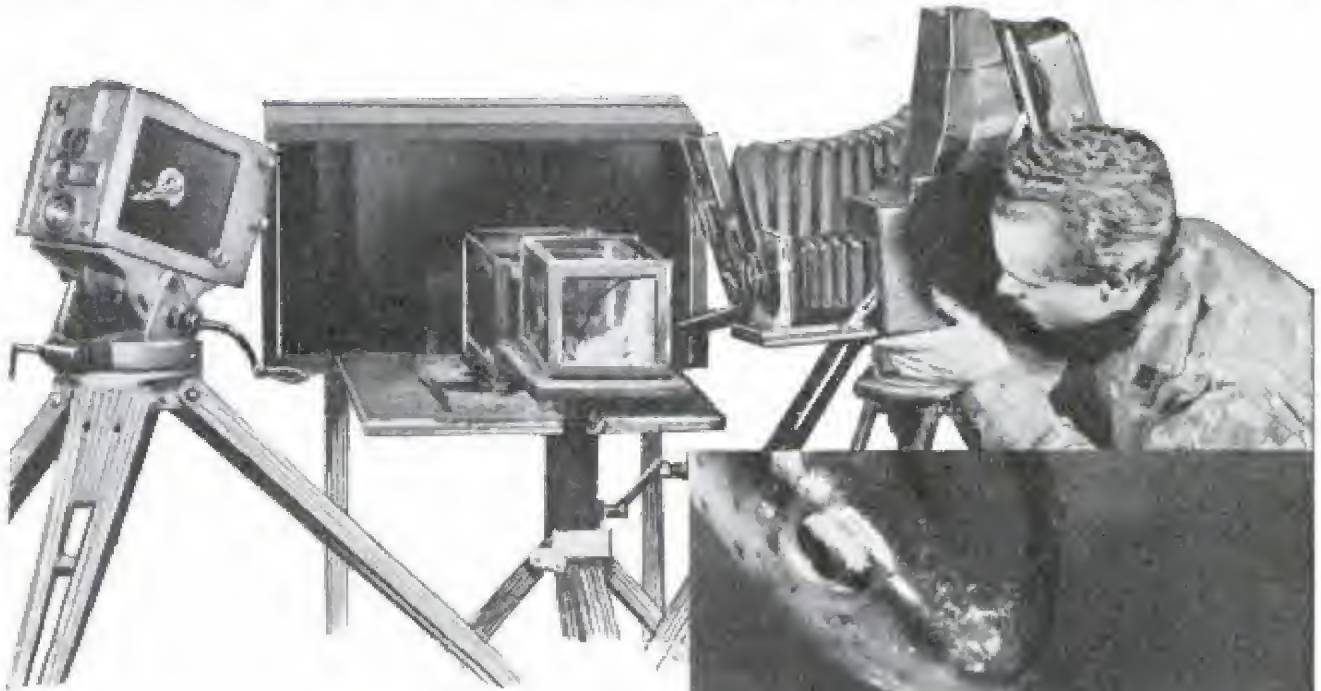
Mechanical Cow Chews and Moos to Attract Customers

Wagging its tail, wiggling its ears, chewing and even mooing, a mechanical cow is a novel advertising device used by stores. It contains motor and rods which provide action of the tail, ears, eyes, mouth and head. The mooing sound is produced by a bellows. Doors in the cow's side open to expose the mechanism.



Doors in side of animated cow lift open to show mechanism that makes it move and moo

Monsters in Fish Bowl Stage Camera Thriller

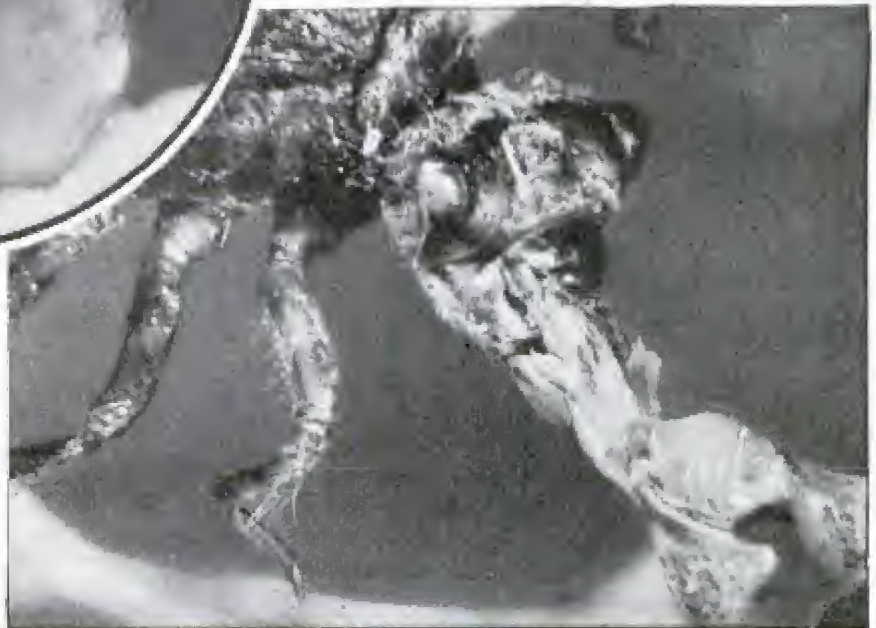


Three cameras are kept focused on small aquariums, ready to record exciting action. That fearful, pop-eyed creature below is just a small, harmless fish



"Water boatman," above, is too busy eating dead fish to see newt swimming down to attack

There's hair-raising drama in a parlor fish bowl. Horrible beasts inhabit it, fighting among themselves for life. Lynwood M. Chace of Swansea, Mass., obtains thrilling pictures by training cameras on bowls peopled with fresh-water pond creatures. Proper lighting and lenses that permit extremely closeup focusing are the secrets of his striking photographs. That deadly creature at the right with tweezerlike claws in its lip is a tiny nymph that will become a dragonfly



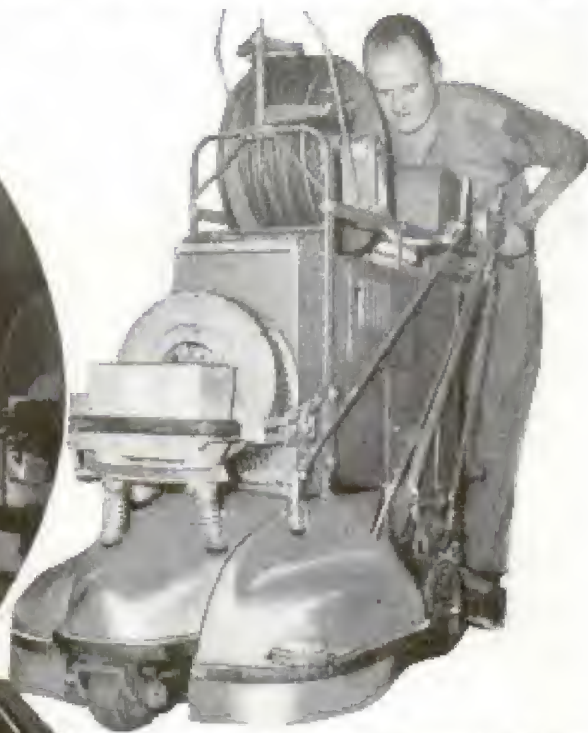
Acme

1000 1095

Polishing Up a Skyscraper While City Sleeps



To keep a modern skyscraper shining, a huge staff is constantly at work in the small hours of the morning, earning its living while the city sleeps. Above, key man in the crew gets watchmen's reports, knows who goes in and out and why, and the location of all workers in the building.



Above, operating big floor-polishing machine which keeps the skyscraper's terrazzo floors like gleaming mirrors. Left, digging chewing gum out of escalator treads gives this night worker a full-time job.



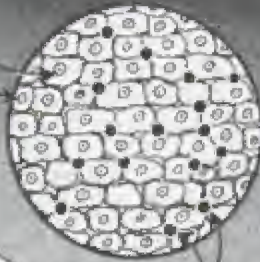
Left, scattered spots of light in the huge RCA building in New York show where hard-working women are scrubbing offices, another task in the process of keeping the skyscraper polished. Right, bronze cleaner, wearing mask, uses electric gun to spray on polishing fluid. The mask protects his lungs against fumes.



RCA Bldg.

WHAT *Your* NOSE KNOWS

SENSORY
EPITHELIUM



OLFACTORY
NERVE ENDINGS

INTERIOR OF
NASAL CAVITY

NASAL NERVES
LEADING TO THE
OLFACTORY LOBE
OF THE BRAIN

BONY PALATE

HAIR ACTS
AS FILTER

ARE we losing our sense of smell? Such a belief is widespread, but it does not have fact as its basis, according to Dr. Ernest M. Seydell, who has spent many years in probing the mysteries of this little-understood sense.

In modern man, he says, olfaction is not a decadent sense but a primitive one. We have allowed it to remain in its original state while developing our sight and hearing to remarkable degrees.

As an analytical instrument, however, the human nose is more delicate than the spectroscope. Not one of our other senses is so acute, so extensively connected with the brain centers. And it plays a greater part in determining our behavior than we realize.

"Our innate objection to bad odors," Doctor Seydell states, "preceded many of the great scientific discoveries, which, in turn, removed the unhygienic factors responsible for these odors and also has succeeded in protecting us from many of our infectious diseases. In fact, the degree of advancement of a civilization according to our standards may be measured roughly by the absence of objectionable odors."

In our world, few things are



Sketch of human olfactory system, showing how odor sensations reach brain by way of nasal nerves. Below, chemical breath smeller helps to determine whether motorist has been using intoxicants

Developed by the Colloidal Chemistry Division, U.S. Bureau of Chemistry, U.S. Department of Agriculture

1023-1st National Bank Bldg. Wichita



actually odorless and though the sensory impression of a smell is vague and hard to define, it evokes a strong feeling tone. "Sights and sounds," he says, "are full of instant meaning to us; they belong to our directive mechanism and set us thinking. Smells, on the other hand, set us feeling."

Although modern medical men are either indifferent or skeptical of the value of odors in diagnosing cases, there have been times when this method was used. Many physicians have described the acid smell of rheumatism, the musty odor of measles, and have also assigned characteristic odors to both diphtheria and typhoid fever.

Our fears, do they find expression in an odor? A number of professional investigators answer in the affirmative. This theory may explain the reason some people are constantly being bitten by dogs. Invariably, the individual was afraid of the animal that attacked him.

Countries and cities have their identifying smells. An odor of sea brine and stag-

nant water is associated with Amsterdam; dead incense and dry dust with Florence, and London, wet soot and dank, cold cobblestones. The predominant odor of New York City is said to be granite and more than one traveler has commented upon the tang of alkali dust in the air above San Antonio and the celluloid smell of Hollywood.

Psychologists tell us the unexpected notions and recollections that pop into our minds are occasioned by the stimulation of some fleeting odor. A whiff of fresh sawdust may cause an individual to think of events of his youth when he played around a sawmill.

Smelling plays a prominent part in the perfume industry, one company insuring the olfactory organs of its chief smeller for \$50,000. Memorizing the odors of all ordinary flowers, fruits, and animals, together with a large number of chemicals, is part of the nasal education of chemists in perfumeries.

The acuity of this sense varies in persons, just as it does in birds, animals, and insects. Olfactory disturbances have not only robbed individuals of many of life's pleasures but have been known to cause



Top, smelling water to determine odors which may be removed by chemical made by his employers. Center, butter grader checking fresh butter for aroma. Bottom, mechanical nose detects carbon monoxide in manhole

malnutrition and mental unbalance. "One investigator," comments Doctor Seydell, "reported the case of a physician to whom violets had the odor of phosphorus. Another person who took a headache remedy smelled a continuous odor of cinnamon."

Much of what we think of as taste is actually smell. Paradoxically enough, most substances we smell do not taste. For proof, just close your nose and try to tell the difference between a slice of apple and one of onion by your sense of taste.

There is also a quantitative difference, Doctor Seydell explains. "We taste only relatively strong solutions," he says, "we smell very dilute ones. This can be demonstrated best by substances we can both taste and smell."

"Because of their qualitative difference, the two are used in a very unlike way. In

(Continued to page 144A)



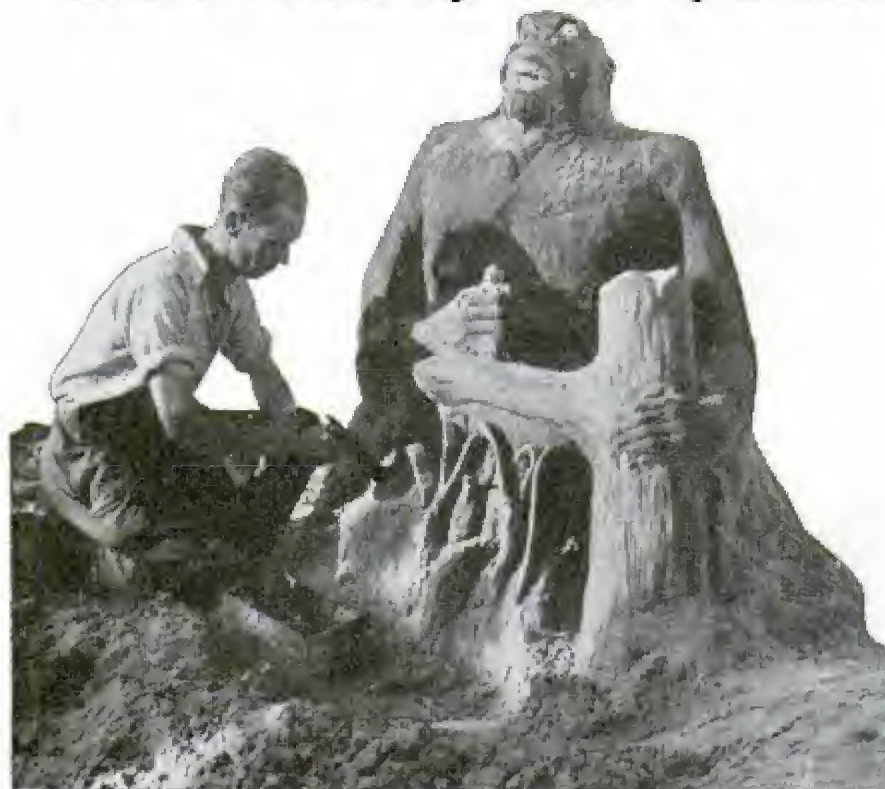
Blindfolded and with nose closed, the man at left finds it impossible to tell difference between apple and onion solely by the sense of taste. The sense of smell quickly reveals the difference



Left, sampling air at working face of mine with detector to find if gas is present. Right, sampling line and mechanical nose in use to discover gaseous condition in manhole

*the CO indicator
made by
mine
Safety
Apparatus Co. Bradock*

Monster Shaped from Sand Made Real by Coat of Paint

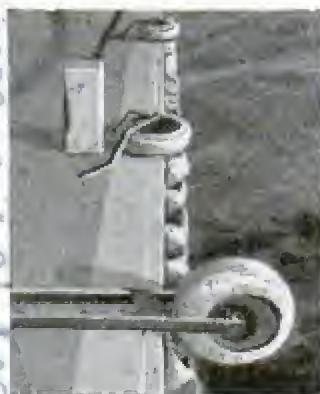


© Hamlin of Brighton

Sand sculptor at English seaside resort finishes image of monster by applying a paintbrush. The paint produces an extremely realistic effect

It's only sand, this simian monster snarling from behind a tree stump. Visitors to an English seaside resort are occasionally startled at the appearance of a prehistoric monster or wild animal on the bathing beach. The creatures are the work of a sand sculptor, who after shaping them heightens the realistic effect by adding a coat of paint.

Wheels Along Dock Guard Boat from Chafing While Moored



Discarded automobile wheels mounted along the edge of a dock form "roller bearings" for mooring a boat, preventing any scraping or rubbing of paint. California yachtsmen use balloon-tired car wheels or

wheelbarrow wheels to protect their boats. Tires mounted horizontally let the boat slide in to the dock without touching it,

and after the boat is made fast, vertical wheels on hinged arms are swung out, projecting slightly beyond the horizontal wheels and letting the boat ride easily against them while moored. The tires are kept partly inflated and are covered with canvas to prevent marking the boat.

Truck Body Door Rolls Up Like a Window Shade

Made of flexible steel, a new type of door for the rear end of trucks rolls up like a window shade. It travels in a groove and disappears under the roof of the truck. The door automatically stays in any position, making it possible for the driver to open it only part way to remove a single parcel. Trucks equipped with the door can back closer to the loading platform than those with swinging doors.



Opening like a roll-top desk, this flexible steel door makes it easy to load and unload truck.

Chafing prevented by use of Island Caley
104. Bullion

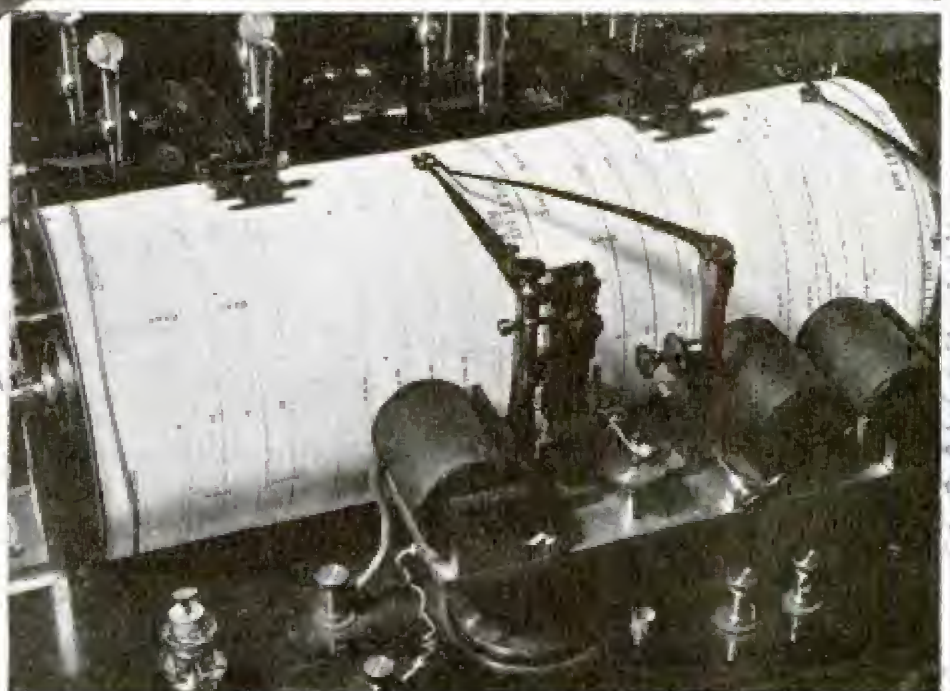
Metropolitan Body
Ridgely

Robot "Weathermen" Log Sun and Winds



Keeping tab on weather is a job for robots. No weatherman can sit with stop watch to clock the sunny hours. Instead, automatic recorder, above at left, is always on duty counting minutes of sunshine. Forecasts are based on observations at 8 a.m. and 8 p.m. at 300 U. S. stations, and automatic instruments collect data. Above at right, measuring twelve-hour rainfall

Snow gauge, above, is accurate to one-hundredth inch. Triple register at right records wind direction and velocity, sunshine and rainfall. Each meteorologist reports twice daily the maximum, minimum and current temperatures, air pressure, precipitation, wind conditions and state of weather



English - maker unknown -



Shutting off the current when the brew is ready, an electric teapot is the latest thing for the home. When the water boils, it automatically passes up through the curved spout into the warm teapot. The tea is brewed and when the teapot is filled, the pot shuts itself off automatically.

California Walnut Association

meats, the college of agriculture at the University of California has contrived a way to blast from within. Nuts are fed into a machine and pass over a circular saw which cuts a slot in the shell. Then jets inject into each nut a bit of non-poisonous explosive gas. As the nuts drop into a circular burner, the gas blows up, cracks off the shells and blows them away.

W

Wash this



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fed
lar
men
on
rop
up
ay.

Colbert & Corley, 55 1/2 Jackson Blvd. Chicago

the porch w
H 1291



Made with a metal circular body so that it rolls if it overturns, a new school bus offers greater safety for its occupants. Since the vehicle would roll, instead of hitting flat, it is said to resist smashing more than the conventional-type bus. The windows are set into the side of the bus as an added safety factor.

Wm. J. Kirk
Harris Sentinel Club

Office 'Mike' Helps Direct Distant Building Job

Microphones, loud speakers and field telephones have been combined in an independent communications system for directing construction of a \$2,000,000 apartment development in New Jersey. A radio microphone in the central office is connected to five loud speakers installed in trees on the twenty-six-acre tract where the construction is under way. Telephone handsets also are attached



Bottom, issuing building order over the office "mike." Circle, loud speaker in tree carries message to all workers on the job. Top, field engineer calls back on tree 'phone for further instructions

to the trees for communication with the office. Thus, an order spoken into the "mike" at the office reaches all of the more than 300 workers on the job, the five loud speakers broadcasting the message simultaneously. Should an engineer require still

further instruction or clarification of the order, he calls the office on the tree 'phone. The central office then locates the plans of the section about which the engineer is calling and complete details are broadcast over the loud-speaker system.

'Shivering' Alloy Turns on Heat at Drop in Temperature

Alloys that "shiver" at a change in temperature and can be made to operate electric switches automatically are the latest discovery of the metallurgist. The alloys are various mixtures of iron, nickel, chromium and silicon; by varying the proportions, the metal can be made to "shiver" or lose its magnetism at any desired temper-

ature from 150 below zero to 1,100 degrees above. It could be arranged to turn a heating plant on and off or to turn on a fan, sound a fire alarm or control refrigeration and air-conditioning machinery. The development is based on the knowledge that different magnetic metals lose their magnetism at varying temperatures.

Chemical early news
11/13/39

Unwarmed by L. R. Jackson and
11/13/39 Russell R. Hall

memorized ductile
Columbus. Ohio

Fast Car Resembling a Plane Has Vents for Rocket Power



Notice the "rocket tubes" in rear of this car, which looks like a wingless airplane. It is driven by a supercharged motor

Closely resembling a small airplane without wings, a streamline automobile built recently has a speed of 115 miles per hour. Its eight-cylinder motor is equipped with a supercharger. Vents for rockets are provided at the rear of the speedster, indicating that its maker may be contemplating experiments with rocket power. Made of aluminum, the car cost \$16,000.

Filter for Car Radiator Hose



Overheating of the automobile engine may be reduced considerably through the use of a water filter mounted directly on the radiator hose. This filter removes foreign substances from the water, helping

to prevent clogging of the small passages in the radiator core. Water from the motor

is thrown against a screen in the filter. The mesh of this screen is smaller than the radiator core. The shape of the filter gives the water a whirling action which deposits sediment in a glass bowl offset from the water line.

Cold Light for Enlarging Reduces Exposure Time

Mercury vapor and argon gas are combined in a tube light for photo enlarging that cuts down the exposure time. The light from this filamentless bulb is largely blue, with some green but no yellow, red or heat rays. Photo printing papers of the chloride, bromide and chloro-bromide types are highly sensitive to blue light but not to red, so the mercury-argon lamp is efficient for these papers. Another advantage is that it is a cold light and there is no danger of heat damage to the negative.

Portable Gas-Driven Tool for Drilling or Grinding

Powered by a small gasoline motor, a portable tool for grinding, drilling and concrete surfacing is handy where no electricity is available. It operates at 3,500 revolutions per minute, top speed. Attachments for sanding, polishing and cleaning may be obtained.



Finishing a concrete surface with hand tool driven by a portable gasoline engine

Latest Pursuit Plane Retracts Landing Gear



Aerial view of new pursuit ship. Note that landing gear has been retracted.

Powered by a liquid-cooled engine, the U. S. Army Air Corps' latest pursuit plane has two machine guns synchronized to fire through the propeller. The craft has retractable landing gear. Oxygen apparatus

permits its operation at extremely high altitudes. The ship's radio is co-ordinated with an anti-aircraft alert net, so that it may be guided from ground posts to intercept hostile bombing planes.

Tractor Plows Up Bottom of Lake to Improve Beach

Two acres of lake bottom in Minnesota have been converted into a clean, sandy beach by a sea-going tractor and gang plow. Equipped with ground-gripping tires that had sufficient flotation on the oozing lake floor to keep it from sinking, the tractor pulled the plow back and forth over

the grass and thistle-filled muck bottom. Disking and harrowing followed, resulting in a clean beach on which nothing was left to injure the feet of bathers. The work extended as far from shore as the operator could go without getting water into the tractor motor. Much of the job was done with the tractor's front wheels submerged.



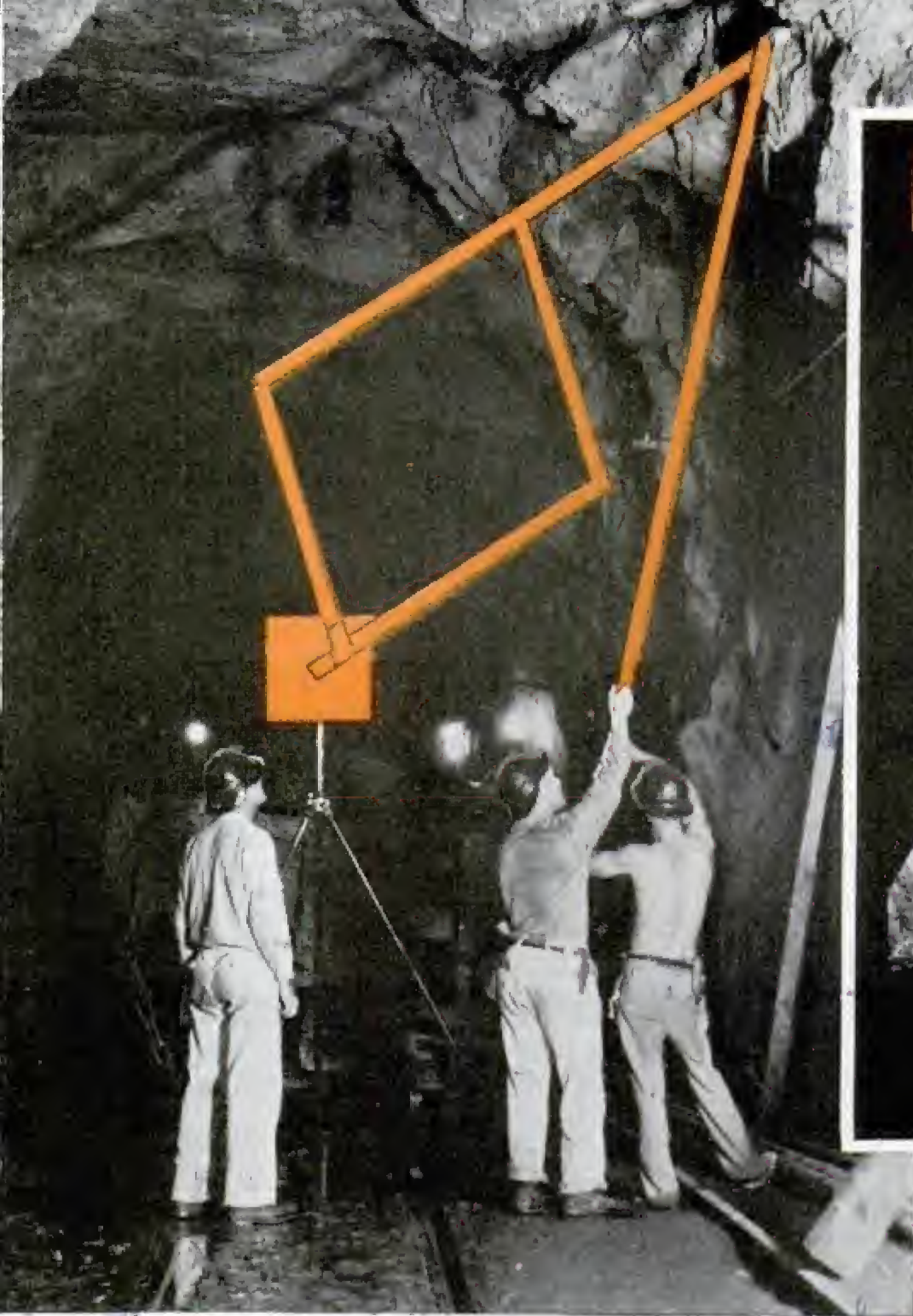
Plowing lake bottom with sea-going tractor to provide smooth beach near shore. The tractor's front wheels were often submerged.

Greater Demand for Gasoline Forecast

Oil men anticipate a four-per-cent increase in gasoline consumption this year as compared with 1938 because of the upswing in new car sales and other encouraging business signs. The American Petroleum Institute forecast the minimum need of the nation at 80,000,000 barrels.

Gerry. Keith. Albany.

50 w/50 at H. new.



HUMAN



Cleo's Barge
Left, using instrument to detect outjutting rock in tunnel. Right, and on opposite page, surveyors silhouetted in tunnel.

1157
AFTER battling stubborn granite, dangerous "heavy ground" and tremendous water pressures for more than five years, engineers and hard-rock miners have won a victory over "old man mountain."

A thirteen-mile bore has just been "holed through" in Mt. San Jacinto, seventy-five miles east of Los Angeles. It is the eighth longest tunnel in the world.

Of the struggle to carve through the mountain, B. C. ("Mike") Leadbetter, general superintendent, says:

"San Jacinto may not be the longest tunnel in the world, but believe me, it has

San Jacinto
caused more headaches than the other seven combined!"

Total cost of the San Jacinto tunnel will be \$15,000,000—about twice as much as the original estimate. It is the major link in a 400-mile chain of tunnels, canals, siphons, conduits and distributing lines which will transport a million gallons of water daily from the Colorado river to Los Angeles and twelve other cities of the Metropolitan Water District of Southern California.

Six dams, seven reservoirs, five pumping plants, 108 miles of tunnels, sixty-three miles of lined canals, fifty-five miles of conduits, twenty-eight miles of siphons

1539 S. Beverly Blvd.
West Los Angeles, Calif

MOLES *Battle a* MOUNTAIN

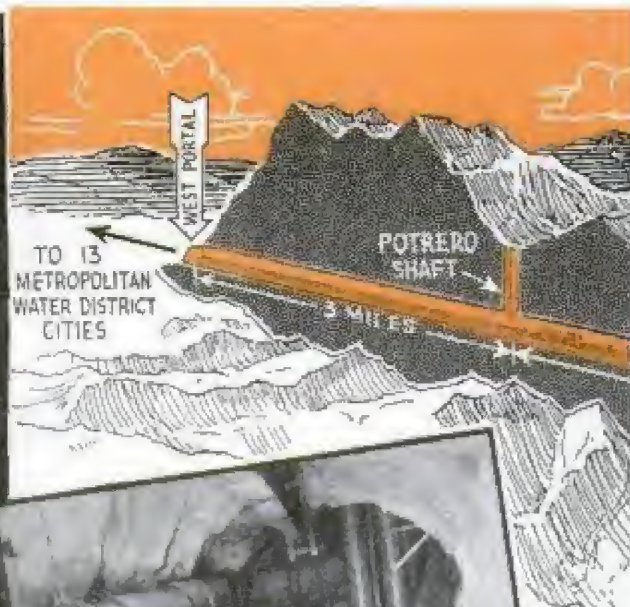


and 155 miles of distributing lines have been constructed. Much of the \$220,000,000 aqueduct system was built without strenuous opposition from nature. All the other thirty-seven tunnels were completed on schedule and below estimated cost, but at San Jacinto nature concentrated her fury. For her most effective weapon she chose the very thing that man will carry through the mountain—water.

For months two crews had worked toward one another—inch by inch. Finally the drills of one crew chattered through the last thin rock partition. The slim holes were loaded with explosives and the crews retreated to safety. "Mike" Leadbetter closed the elec-



Surveyors at work on job which showed that the best route for the Metropolitan Aqueduct lay across deserts and through mountains. San Jacinto presented the toughest problems



tric switch to fire the charge. First, a low rumble and then a surge of sound shook the mountain.

"She's holed through!"

From the throats of half a hundred men burst that cry as the two gangs raced to see which could get through the jagged hole first.

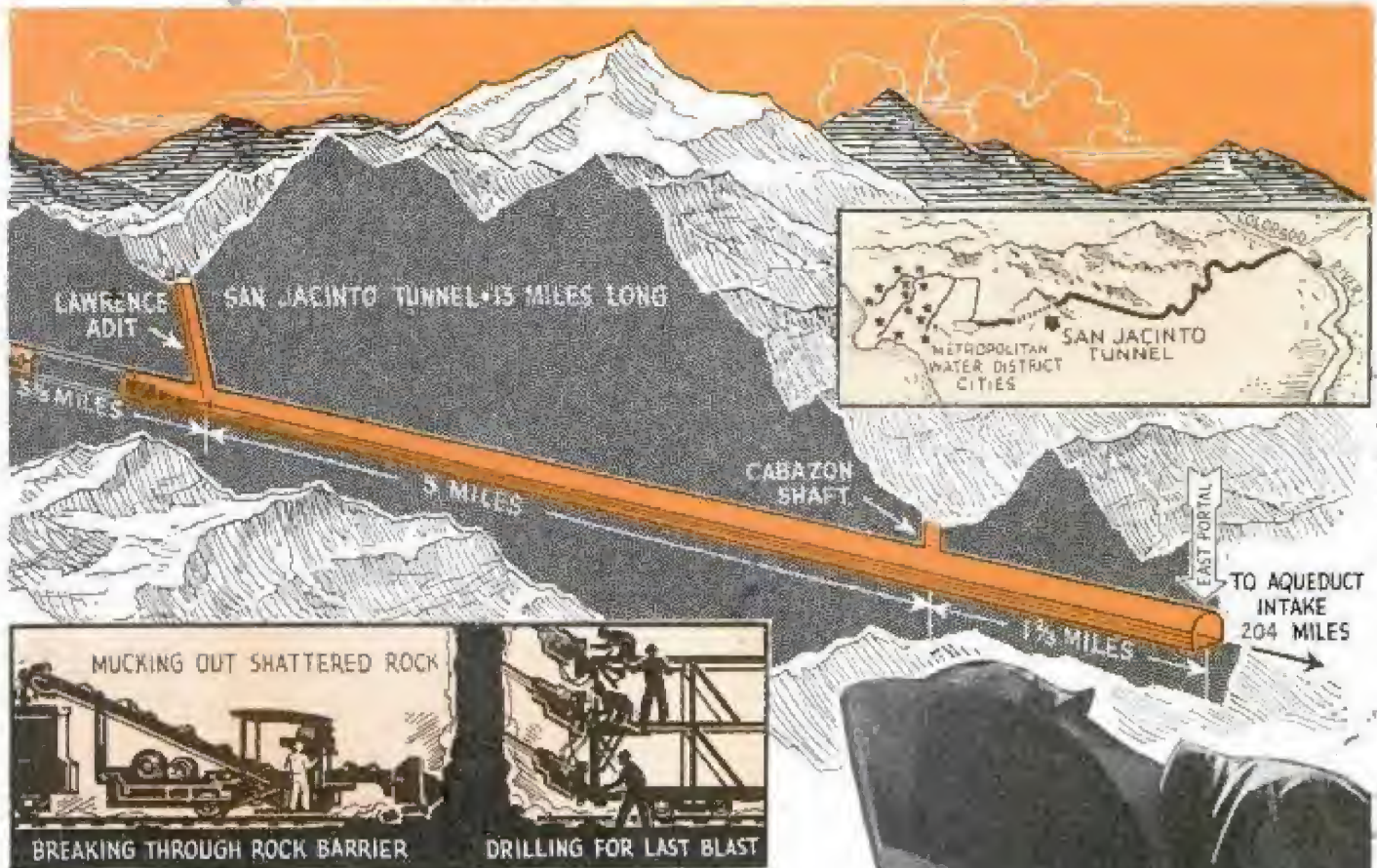
And the two shafts met exactly. Modern science and engineering had cooperated to bring two holes together deep in the heart of the mountain. Surveyors had kept a constant check on the progress of the tunnel to see that it varied not a fraction of an inch. Working with precision instruments, they could detect the slightest deviation in grade or angle.

The "battle" of San Jacinto was begun May 13, 1933. Preliminary surveys showed that the best route for the aqueduct lay under one shoulder of the mountain, which towers 10,805 feet. To have



Top, left, testing concrete plug in laboratory. Center, one of the huge batteries of pumps used in tunnel. Bottom, left, machine-miner setting drill. Center, water pouring from ceiling and sides of bore. Right, mucking machine carrying away shattered rock after blast

Metropolitan Water District



driven the tunnel straight through the mountain, from east to west, would have taken about twenty years. So, instead of excavating only from the east and west portals, it was decided to sink two vertical shafts and a slope adit along the route of the tunnel. With drilling crews working both ways from these auxiliary entrances, it was possible for eight crews to attack the mountain instead of two.

Here is what you would have seen if you had visited the tunnel before it was "holed through":

First you put on a "hard hat" for an excursion into the bore with Superintendent Leadbetter. The hat is made of pressed paper as tough as steel. Underground work is in progress twenty-four hours a day, seven days a week, with electricity illuminating the scene.

The air is fresh, being pumped into the tunnel, and the temperature is about that of rock temper-



Top, map of the system, showing San Jacinto. Center, welder repairing drilling equipment. Bottom, "heavy ground" section where huge timbers are placed close together to prevent cave-ins

(Continued to page 122A)

Door Lens Reveals Caller But He Can't See In



Housewife answering doorbell can see caller in two-inch lens, but the visitor cannot see inside

By means of a one-way "eye" in the front door, visitors can be seen before they are admitted to the house. Instead of the usual "peephole" which lets the caller look in, this device is a two-inch hand-ground lens. Outside, there is only a tiny hole visible. From the inside, the reducing lens shows clearly who is ringing the doorbell. It can be mounted high at an angle so that children can glance up and see outside.

Ten-Step Photo-Light Control Varies from Dim to Flood



Ordinary electric bulbs can be varied from dim light to a brilliant flood by a ten-step control switch offered for photographing, printing and enlarging.

and focusing for an indoor scene, the cameraman can turn the control to normal or less, then adjust it to full floodlight for the brief moment required for exposure. Similarly, the switch permits positive control during printing and enlarging, allowing adjustment of the light according to density of the negative.

Light Globe Is an Insect Trap with Removable Base

Attractive as a light fixture and attractive to insects as well, a ceiling globe of diffused glass has three funnel slots to lead moths and other insects to their destruction. Light invites the moths in, the superheated air kills them and they drop to the removable base which is easily emptied. The globe is designed for kitchens, porches and stores.



"Eyes" Guard Hydraulic Brake and Warn of Leak in Line

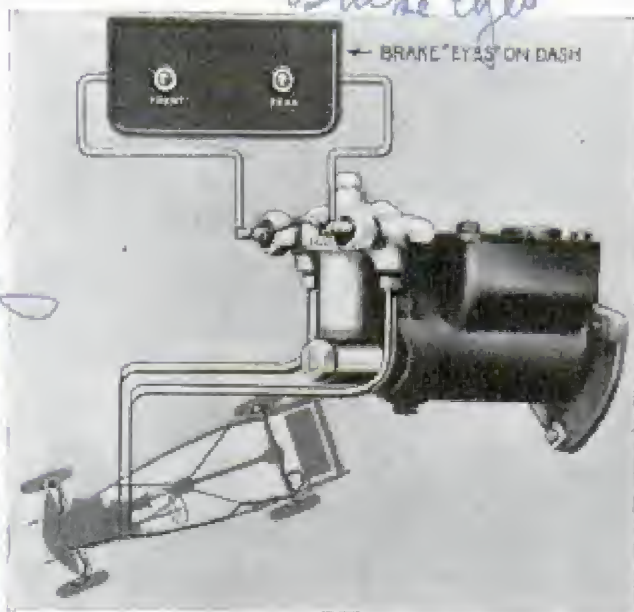


Diagram of protective system for hydraulic brakes, which shuts off defective line and warns driver

Hydraulic brakes are given an added safety factor by an automatic "sentry" just developed, a unit that stands guard over

Distinctive Creations
10 W. 47th St. New York

11289

Protecto-Scope

One Miller Co.
200 Center St.
Meriden Conn

11289

11253

11277

11332

11496

Photo-Light Control

Ordinary electric bulbs can be varied from dim light to a brilliant flood by a ten-step control switch offered for photographing, printing and enlarging.

Diagram of protective system for hydraulic brakes, which shuts off defective line and warns driver

Hydraulic brakes are given an added safety factor by an automatic "sentry" just developed, a unit that stands guard over

American Photo-Adapt Products Co.
162 N. Franklin

the hydraulic system and seals off the defective line whenever a break occurs, at the same time warning the driver. Loss of even a small amount of brake fluid through leakage causes failure of the system and leaves the driver without brakes. But this automatic device assures him at least two brakes. It consists of a unit attached to the master hydraulic cylinder and a dash signal. Whenever a break occurs in one of the lines, a balanced Neoprene ball is forced by the hydraulic pressure into a seat leading to the defective line and seals it off without further loss of fluid. Front and rear brakes are fed by separate lines so that if the Neoprene ball goes into action to shut off the front brake system due to a leak, the rear brakes are still in operating condition. On the dashboard, two red "eyes" marked "front" and "rear" flash every time the brakes are applied, but when a leak occurs the lamp representing the inoperative section fails to light.

Bacteria Change Wood Sugars into Valuable Chemicals

Chemists have put bacteria to useful work in transforming sugar made from wood into valuable chemicals. Sugars already are being produced commercially from such trees as hemlock, beech, maple and birch. At the University of Wisconsin, these sugars were fermented experimentally by the agency of bacteria, and the products were butyl and ethyl alcohol, acetone and isopropyl alcohol.

Conveyor Belt Delivers Coal Direct from Truck to Bin



Conveyor belt delivering coal at right angle from rear of truck to window of bin

Model Guns of Balsa Wood Latest in Hobbies



Model-maker working on his miniature machine gun with pair of tweezers

Creating balsa wood miniatures of destructive military equipment is the hobby of one military academy cadet. His model of a Browning machine gun captured top honors at a recent hobby show. The tiny weapons are complete in every detail.

Delivering coal directly from truck to bin, an endless conveyor belt eliminates shoveling and wheeling and so reduces delivery costs. The belt is eight inches wide, of heavy-duty rubber, mounted on two aluminum pulleys and driven by the truck motor. The conveyor will unload coal or other commodities into an elevated opening, and in combination with an auxiliary chute it will carry over a fence, hedge or terrace.

Inquiries as to makers of articles described in Popular Mechanics, will be answered by our Bureau of Information upon receipt of return postage.

Dear Wood Industries, Inc. -
Harris and Boda Bros.
Electro-
Mechanical

191 760 m
see 200 1036 161
88/10/11
same source

H135

H1356

Truckveyor

Madison Wis

Madison

Cadet R. A. Hill
Valley Forge Military Academy
Watson, Pa

Model-maker working on his miniature machine gun with pair of tweezers

SUPER-SAFETY *Goes*



and boat drills were held simply because the law demanded them. Passengers were inconvenienced as little as possible and in some cases the drills were slack. Today the whole merchant marine is determined that there will never be a repetition of the "Morro Castle" disaster. Training in emergency work is conducted continuously and thoroughly because emergency gear worth hundreds of thousands of dollars is worthless unless the men know how to use it.

No one ever knows when fire will break out on a ship. Likewise few men know when a fire drill will be held. At a quiet word from the captain or chief officer a man goes down to a cabin or cargo hold and operates the alarm apparatus. The first warning comes in on the

SEVEN short hoarse blasts and a long one on the whistle throw the normal routine of a great passenger liner into turmoil. Vibrating all through the ship, the "all hands on deck" signal sends crew members struggling into life belts and jumping to their boat stations.

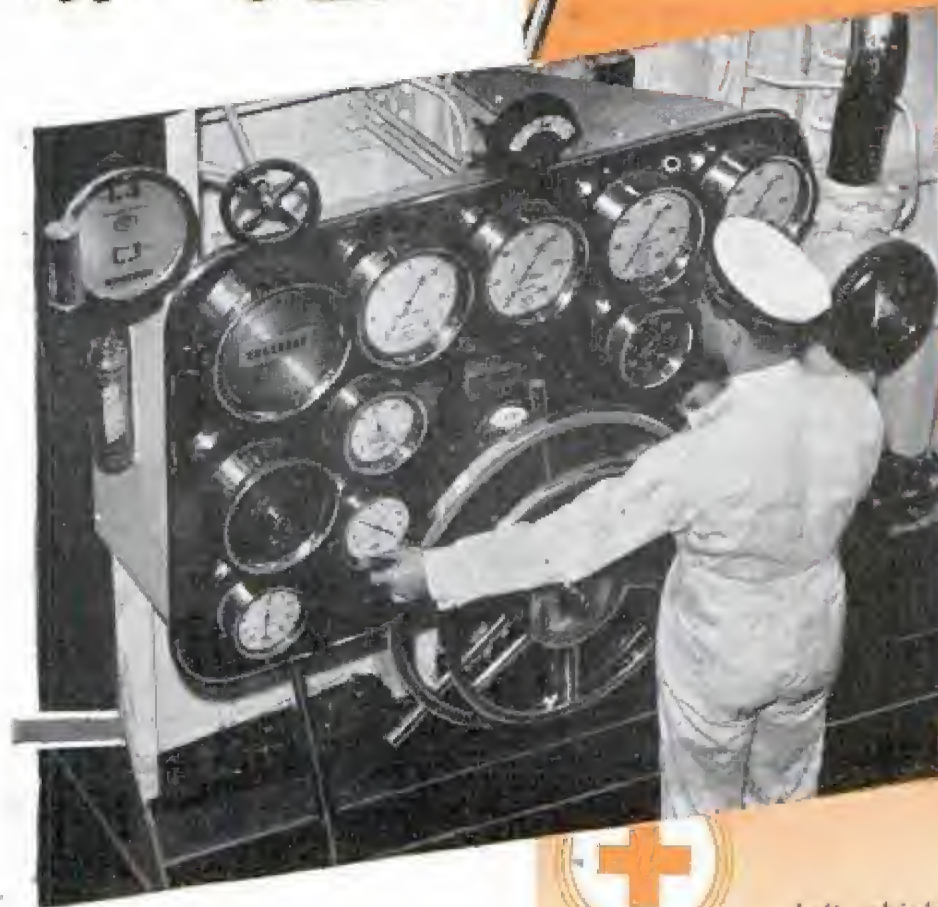
On deck, life-jacketed men swing out the boats and ease them down to the rail. Inspectors stand by, watches in hand, while squads of men scramble into the swaying boats and are lowered away. Down on the water, the ship's motorboat casts off from its falls and moves away while the crews of the other boats break out their oars and follow. On the motorboat the radio operator descends into his watertight compartment and calls a station fifty miles away. The drill ends when blasts from the whistle recall the boats to the ship.

Passenger-liner crews play the game of "abandon ship" every week and they play it in grim earnest. The game has to be played exactly as if an emergency existed. Every man has to be letter-perfect in his duty. A decade ago fire



Above, servicing whistles of big liner. Below, emergency crew equipped with stretchers, fire hose and breathing and lifesaving equipment

to SEA



automatic alarm system on the bridge. Then general alarm bells all through the ship begin to sound. A man is sent up on the flying bridge to strike rapidly on the ship's bell. The officer on watch steps over to a smoke-detecting cabinet to see if smoke is coming up from the location of the alarm. A puff of cigarette smoke blown into a tube by the man who operated the alarm can be detected on the bridge.

Meanwhile, the ship's special emergency squad has been assembling. An officer leads the way to the scene of the alarm signal. Water lines are unrolled, hose is connected to the nearest high-pressure fire-fighting water mains, and men in

Left, ship's engine controls. Right, rescue-squad man. Bottom, inspecting motor lifeboat. Radio and engine are carried in watertight compartment



Reference: Bureau of Marine
Investigation and Navigation



asbestos suits and breathing apparatus go through the actual work that they would if a real fire was being fought. Up on the bridge, a valve is turned to close all watertight doors and fire screens. A master switch shuts down every air-conditioning and air-circulating motor on the ship. Hand pumps and fire pumps all over the ship are tested, the men directing the big streams of water out over the rails. As part of the drill a man presumed to be disabled in the fire is fastened in a basket stretcher and carried up to the boat deck. Officers with check lists in their hands move rapidly from deck to deck, noting the operation of each piece of equipment and the ability of the men.

Thorough fire and boat drills are usually held in port but supplementary drills are held at sea. At least once each voyage passengers are assembled at their boat stations and rehearsed in fastening on life belts while the master of the ship ad-



Left, cadet-quartermaster at wheel and officer on bridge of S.S. "Matsonia." Right, removing plate from condenser for inspection. Bottom, boats ready for lowering in "abandon ship" drill

dresses them over the loud speakers, giving instructions as to what they should do in a real emergency. Once a week, also, comes a "man overboard" drill. A boat is swung out over the side ready for lowering and the ship steams around or stops and goes astern just as if a man were to be picked up from the water.

Seeking greater safety on the sea, the Department of Commerce has tightened up its regulations in the last couple of years. Approved types of fire-fighting apparatus, more fire-resistant materials and bulkheads, and loud-speaker systems leading to the crew's quarters, public spaces and decks have been ordered installed on ocean-going passenger ships. Some vessels were held in port until the improvements were made. Exam-

inations for seamen and officers have been made more stringent. Greater care in avoiding accidents is part of the campaign. Officers and seamen are being better qual-

ified to keep their ships out of danger. Hourly patrols are supplementing fire-alarm apparatus. Operating gear, such as the engine-room telegraph and the steering apparatus, is duplicated so that the stand-by system can be used if failure occurs.

The bridge is its brains and the center of a ship's nervous system. On the bridge the officer of the watch commands the speed and maneuvering of the vessel. Telephones connect him with the look-out in the bow and with the engine room. On another phone system he can call any station on the ship. Alongside the fire-alarm panels on the bulkhead are deck plans showing the location of all fire and emergency apparatus on board, the position of hydrants, extinguishers, Foamite outlets, escape manholes, and fire doors. He operates the general alarm system by pulling a switch, and closes all the watertight doors on the ship by pulling another. The ship's whistle and siren levers are under his hand, as are the controls of a high-intensity searchlight. He can address every person on board from the loud-speaker



Top, crew members at lifeboat oars. Center, operator at panel of ship-to shore radiophone system. Bottom, emergency steering gear down in stern of ship

panel and by throwing a switch he can convert the speaker system into an emergency telephone to talk back and forth with some one at one of the speaker outlets.

Two quartermasters, a junior officer, and the officer of the watch usually occupy the bridge, with one of the quartermasters standing guard over the "metal mike" automatic steering gear that keeps the vessel on its course. If the device should break down he can steer the

(Continued to page 141A)

Shark Nose on Bombing Plane Is Aid in Sighting



Designed to permit use of a new bombing sight, this plane's nose accidentally assumed the shape of a hungry shark

Giving it the appearance of a hungry shark, an odd-shaped nose on the latest Army Air Corps bombing plane permits use of a new and secret bomb sight. This device automatically figures out the speed of the plane and its altitude in relation to the target in order that a bomb may be dropped at the exact second necessary to score a hit. The bomber is powered by two engines.

Roar and Whisper Equaled by Radio Voice Leveler

Whether you bellow in oratorical voice or speak in feminine whisper, the "vogad" will level your voice to normal volume over the radio telephone. A monotonous voice that accents strong and weak syllables equally may seem

tiresome to the listener, but a monotone is best for radio reception. The "vogad" is designed to level off the hills and valleys of shouts and soft words emanating from the transmitter; it reduces strong syllables quickly enough to avoid overloading the transmitter, and boosts weak syllables to prevent the listener from missing them. The name of the instrument is a coined word made up of the first letters of the words: "volume-operated gain-adjusting device."

Fish-Like Motorcycle Hood Helps Set Speed Record

Over the same Utah salt flats where Eyston and Cobb recently drove their monster automobiles at nearly six miles a minute, a hooded motorcycle has set a new American record of 137.40 miles an hour. Like a roaring dolphin the two-wheeler flashed over the measured mile, its rider completely encased in the streamline shell, the rear section of which slides backward to admit the rider. The covering is of balsa wood laid over a framework of airplane tubing, with fabric glued over all. Vents in the nose admit air to cool the engine, the air escaping through louvers in the sides of the tail. The driver peers through a synthetic glass window slotted into the foretop of the shell. There are two recessed landing wheels that



Rear section of "dolphin" shell slides back to admit driver, who sights through window in front. Notice "landing" wheel

Bulder - 2 Haps Arizona
Oakland, Calif

Plane Tubes Like Doughnuts in Water Test for Leakage



Like so many giant doughnuts, tubes for airplane tires are tested for leakage in water vat, thus assuring passengers of more safety

Looking like a huge cooking utensil holding giant doughnuts, a testing device subjects airplane tire tubes to submersion in a search for leaks. The inflated tubes are submerged in a tank. If the tube is leaking, a stream of air bubbles betrays the flaw and the tube is discarded. While few tubes are found defective, the test is conducted as a matter of safety to the air traveler, since a flat tire might result in the overturning of the plane.

are dropped when the motorcycle approaches a stop. Built by "Hap" Alzina at Oakland, Calif., from a stock model, the "dolphin" has mammoth flywheels, crankpins, connecting rods and wristpins turned out of light alloy metals.

Backflow of Sewer Gas Stopped by Trap Primer

To prevent sewer gas and foul odors from backing into the basement through a floor drain trap, an automatic primer can be installed. This primer is intended to maintain the water seal in seldom-used drains where the seal would often be broken by evaporation. Installed in any convenient cold-water supply line, such as the lavatory or sink, the primer would operate whenever the water was turned on in that line, letting a small amount flow to the drain trap to replenish the seal.

Asbestos Lid Clapped on Fire Smothers Incendiary Bomb



Asbestos-clad fireman drops dome to smother flames started by incendiary bomb. The demonstration was a part of air defense drill in England

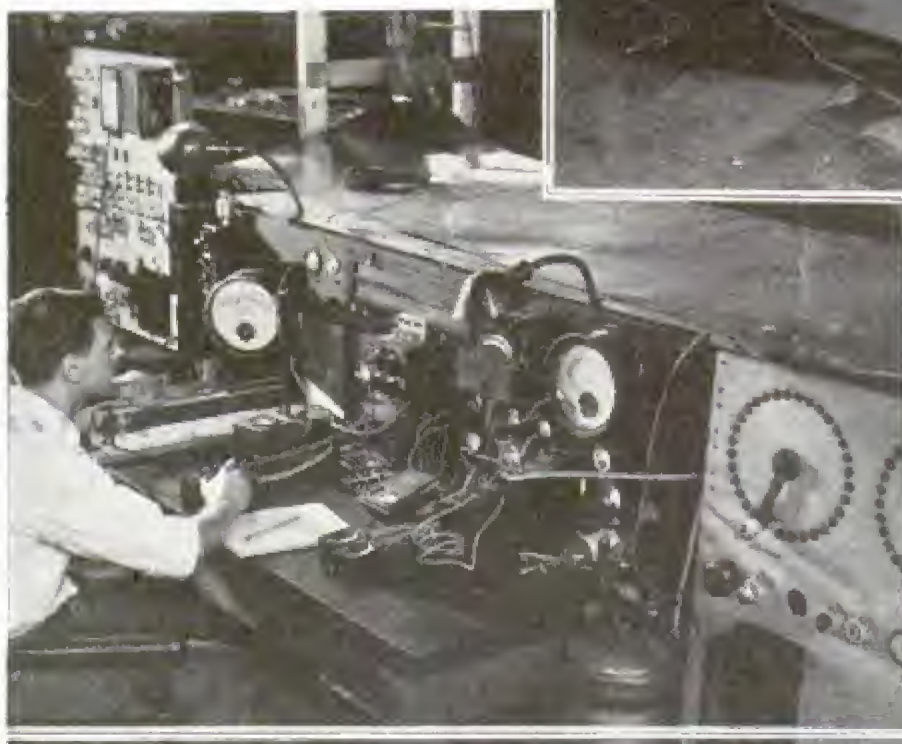
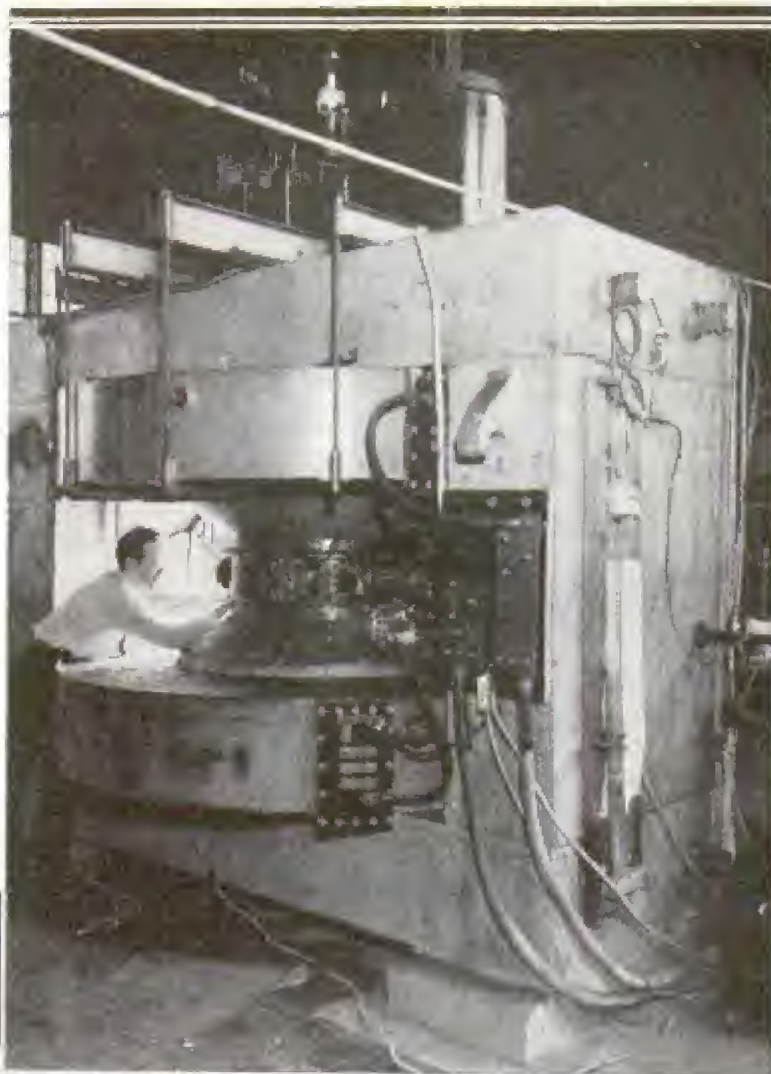
One of the special fire-protection devices introduced in England by air-raid defense authorities is an asbestos cap to be clapped over any small fire started by an incendiary bomb. The dome-like lid is carried on the end of a pole. For his own protection the fire fighter wears a special helmet, gloves and apron.

There are 22,500,000 electrically wired homes in the United States.

North Safety News
Nov. 1938

Atom Smasher Aids Research in Many Fields

Through the use of a cyclotron, a huge machine designed to smash atoms, at the University of Chicago, scientists are delving into the mysteries of many things affecting mankind. Physicians interested in cancer treatment, physiologists, biochemists and other experts in a great variety of fields are to use this new research tool. An atom, according to physicists, may be visualized as consisting of a nucleus made up of bundles of positive electricity, called protons, and a number of uncharged particles called neutrons. Around this nucleus revolve electrons, tiny bits of negative electricity that balance the positive charge. The cyclotron is a giant machine containing a vacuum chamber fitted between the poles of a super-magnet. One side of the chamber is positive, corre-



Top, the cyclotron, shut down for adjustments. Bottom, the control panel. If an attendant with a pair of pliers in his pocket should approach too close to the big machine while it is operating, the magnetic force would pull the pliers through his clothing, ripping it like paper. Watches must be deposited some distance from the cyclotron to prevent the magnet from stopping them and perhaps damaging the works

sponding to that pole of the magnet, the other negative. Application of high-voltage electricity to the machine creates a powerful field within the vacuum chamber. The way to smash the atom is to unbalance the nucleus, either by breaking it apart or by making it overweight. Atomic particles

are whirled around the vacuum chamber at terrific speeds built up in the powerful field as the difference in potential adds impetus to their movement. Finally the atomic particles fly out of the vacuum chamber and smash against a target at one side of the machine. Some of them pierce

the nuclei of target atoms and if they happen to lodge therein, they create overweight bodies that begin radiating beta and gamma rays. Hence the atom is temporarily radio-active. So strong is the attraction of the super-magnet that a nail held in the field can be bent but not moved by the hand. Liquid oxygen, having magnetic properties, swirls toward the magnet instead of falling straight to the floor when poured into the air. The magnet even attempts to unwind coiled filaments of heating elements placed between its poles. Striking the machine's oscillator with a copper bar sets off an arc that will burn like a flame, more than a foot high, for as long as desired. Watches are stopped and sometimes damaged if exposed to the powerful magnetic forces of the cyclotron.

Multiple-Arch Dam to Hold Vast Irrigation Lake in Check



Nearing completion, Bartlett dam will be the highest multiple-arch dam in the world, storing 200,000 acre-feet of water for irrigation

Thrusting high its battery of arches across the Verde river in Arizona, the Bartlett dam will create a vast lake to serve the irrigation needs of the Salt river reclamation project. This will be the tallest multiple-arch dam in the world. It will hold back a reservoir of 200,000 acre-feet capacity.

Card Index Rotating on Wheel Permits Quick Reference

Rotating file wheels that accommodate cards are the latest accessory for efficient office bookkeeping. A spin of the wheel, which revolves in a vertical plane, brings the desired card to the top quickly, within easy reach and visibility. There are removable segments for transfer of records and division of work, and individual cards can be removed or replaced with one hand. Another file wheel rotates in a horizontal plane on a tabletop.



As many as 7,000 reference cards can be kept on this rotating-wheel file. A quick spin brings the desired card to the top

Lighting experts predict the average American home which used 425 kilowatts in 1926 will use 1,300 kilowatts in 1947.

W. S. to. J. L. H. W. S. to. J. L. H. W. S. to. J. L. H.

Mirror Tool Helps Mechanic Show Parts under Auto



Mechanic using long-handled mirror to inspect underside of the automobile

For showing the condition of auto parts recommended for replacement or repair, a mirror with telescoping handle is available for mechanics. The tool is especially useful in examination of parts under the chassis and back of the panel, not only speeding up the mechanic's work, but also enabling him to show the car's owner exactly what is required to put the vehicle in good shape. The mirror is unbreakable.

Metal Safety Rest for the Flatiron Fastens on End of Board



Reducing the danger of burning the hands or scorching clothing, a handy rest for the flatiron is now on the market.

Fastened on the end of the board, it gives more room for handling large sheets and tablecloths. Edges are turned up on three sides of the rest to prevent dropping the iron to the

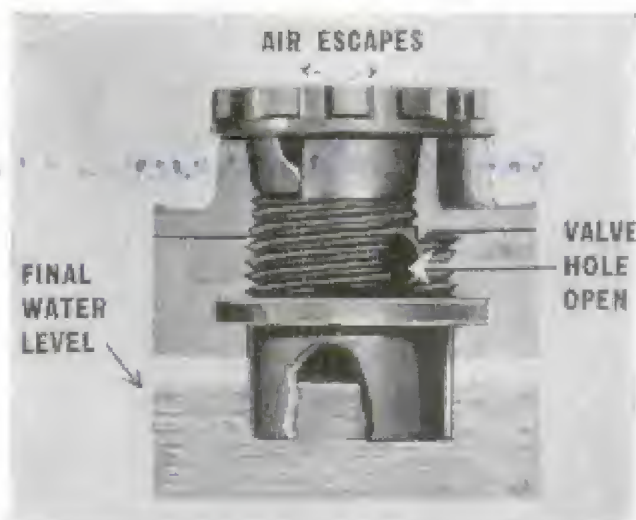
floor. Wide space between the rest and the end of the board makes it almost impossible to burn the pad. The rest is large enough to hold any size iron.

Gasoline without By-Products Made by Catalytic Process

Production of gasoline independently of oil and other petroleum by-products is made possible by a catalytic refining process just developed. In the past, when gasoline was refined from a given crude oil, certain by-products were also produced for which there might be no immediate market. Now, if there is a seasonal market for gasoline alone, the refiner can eliminate the by-products and obtain only gasoline. Essentially the new process is a method of breaking down large molecules of crude oil and trimming or building smaller molecules to the proper size and type to make the grade of gasoline desired.

Battery Is Kept from Flooding by Cap Forming Air Pocket

Overflowing or flooding of automobile storage batteries is prevented by a cap that traps air in the cell. When the lid is screwed down, air vents are opened, letting the cell "breathe" normally. When



Cross-section drawing of battery cap which prevents overflow or flooding of cell

the battery is to be filled, the cap is turned to the left and a threaded barrel moves upward, closing the air vents and trapping air inside the cell which prevents the addition of any more liquid than necessary.

Dear Mr. C. Rock Island, Ill.
H1348
H1329
H1386
H1281
B. H. Broadwell Co.
Akron, Ohio

Pilot Lifts Altitude Record above Ten Miles

Beating his own world's altitude record by nearly a mile, Col. Mario Pezzi of Italy recently established a new high mark for heavier-than-air craft of nearly eleven miles above sea level. Wearing protective garb that resembled a diver's suit more than an airman's uniform, the famous flier took his single-engined Caproni up to a ceiling of 56,017, according to his instruments. His former record, set in May, 1937, was 51,361 feet. On his latest ascent he rode in an air-conditioned, hermetically sealed cabin.

Col. Mario Pezzi of Italy is buckled into high-altitude suit for a venture into stratosphere. He reached 56,017 feet.



Speedy Anti-Aircraft Tank Fires Cannon at 114-Mile Clip

Armed "to the teeth" with anti-aircraft guns, a tank that can chase airplanes at a 114-mile-an-hour pace on paved highways is being demonstrated to army engineers.

On rough terrain this armored dreadnaught can travel seventy-eight miles an hour. Its turret carries a thirty-seven millimeter anti-aircraft automatic cannon capable of firing 120 shots per minute, and in addition it carries three machine guns firing through slots in the front and sides. A driver, cannoner and machine gunner comprise the crew, who are protected by three-inch bullet-resistant glass. The tank weighs 10,000 pounds, a ton lighter than medium tanks now in army use.



Camouflaged tank capable of nearly two miles a minute on highway. Notice anti-aircraft guns in windshield and roof

Although traffic accidents have increased in numbers, the death rate based on mileage has decreased seventeen per cent since 1925.

General Motors Corp. Publicity

Preston Tucker, N.Y.

General Motors Corp. Publicity

at
 said in
 national
 forest
 fire
 in 1927

BRAINS *Against* FLAMES

1x
 1080

Conb. Thomas E. Stinson, Jr. 10565 Holman
 Ave. Los Angeles, Calif



Top, fire fighters pushing into heart of flames behind powerful stream of water. Bottom, modern forest-service fire truck that carries 250 gallons of water, hose and other flame-fighting equipment

CHOKING smoke hung over field headquarters although the advancing flames of the forest fire were still ten miles away. An operator hurried from the mobile radio central to the conference table where the fire boss was holding a board-of-strategy meeting.

"Johnson says he's got to have three or four hundred more men right away," the operator reported. "The fire is running away toward the settlement and he can't hold it. It'll reach the first houses in a couple of hours!"

The commander-in-chief of the fire fighters picked up the latest weather map that the meteorologist had drawn and issued his order: "Tell Johnson he won't need another man. The wind is going to shift inside of an hour and he can start spreading his men out now for cleaning up. The settlement is safe."

He turned again to the blackboard. "This shift in wind, gentlemen," he resumed, "means that we can hold the ridge east of Oak Creek if we get up there by six o'clock. We'll have a bulldozer widen the firebreak. A cou-

2/6/00
Fire, Dispatcher, U.S. Forest
Service, Post Office Building,
Pasadena, Calif.

in the FOREST

ple of tank wagons can stand by. We can pull half the men away from the head of the fire safely and concentrate on stopping it at the ridge.

Five minutes later the new orders were being dispatched to 3,000 men on the fire lines. Zone leaders were contacted by short-wave radio. Scouts carried other orders to isolated groups. The last tanker truck lumbered up the forest-service road to the new battlefield. An airplane roared away with the fire boss as passenger for a survey by which he might judge if the new strategy would halt the fire.

Fighting a forest fire the modern way is like a problem in military tactics. Thousands of men



Left, fire fighters equipped with portable water tanks, slashing knives and electric headlights. Right, starting backfire to burn an area over which the main fire cannot pass



have to be thrown into a forest within a few hours. A housing and feeding organization that didn't exist in the morning must be working smoothly by afternoon. Communication systems covering hundreds of square miles must get into operation at once.

Like the army with its zero hour, the forest service is organized ahead of time for efficiency. Speed is the essence of success in fighting a forest fire. It may take 100 men or more at headquarters and the camps to plan the campaign, move men to new positions, and keep them supplied with tools and food.

At headquarters the fire boss leaves most of the detail work to his chief of staff. The fire boss is the district ranger, the general behind the lines who pores over maps, considers slopes, types of cover and wind directions as he lays out the campaign. The chief of staff contacts crews and issues orders for him. Other staff members are a liaison officer for coordinating state, county, and fire-fighting crews from logging camps, a chief supply officer who checks everything from bread and blankets to

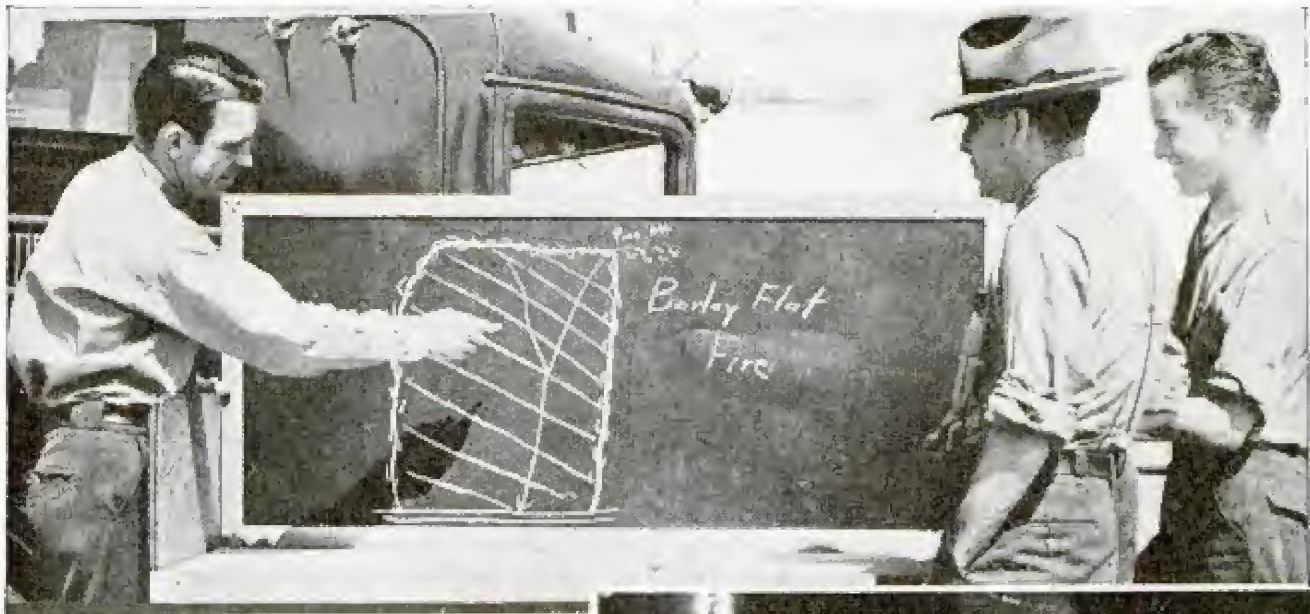
gasoline, a chief of transportation in charge of trucks and bulldozers, and a communications chief in command of the telephone, teletype, and radio circuits.

Attached to headquarters, along with the mobile central radio station, is a weather bureau on a special truck. A separate radio receiver allows the meteorologist to pick up the latest weather reports from the areas he wants. Combined with the observations he makes with his own instruments, these reports enable him to make new forecasts every half hour.

What the weather is going to do may affect the whole plan of battle. Knowing ahead of time that the wind is going to shift, the fire boss can get the jump on the flames by attacking them from a new position. Sometimes he may start a backfire or get "hot spot" crews ready to slash down the brush and fight the fire with portable back tanks.



Top, mobile radio station. Center, food dropped from plane by parachute. Bottom, scene at field headquarters during a forest fire



Fire boss outlining progress of campaign against flames to staff members

Crown fires that race through the tree tops ahead of the main body of fire that eats its way from trunk to trunk are the hardest to fight. In coniferous forests the fire boss tries to cut the head off the fire, stopping its forward run, while in other cases he may decide that a flanking attack is best.

The first objective of the campaign is to try to corral the fire by ten o'clock in the morning following the day of discovery. It takes time to get men in to the fire lines and some of the most effective work can be done



Photos by U. S. Forest Service

*Center, night view of flames roaring through forest.
Bottom, extinguishing small fire with a pack pump*

after dark. Normally there are up-canyon winds during the day that carry the fire toward the ridges but after dark the winds usually reverse, slowing down the flame front. Ten o'clock in the morning is the deadline because if the fire hasn't been beaten by then it is apt to burn all day, helped by heat of the sun and the lowered humidity. Sometimes the "boil up" at about that hour is like an explosion and flames suddenly race ahead as the right conditions of temperature and dryness occur.

(Continued to page 116A)

Lassen National

'Safelight' PhotoPrint Paper Developed in Lighted Room



"Safelight paper" containing orange dye is placed with negative in flexible frame and exposed to light.

Development of photographic prints in a room lighted by a 100-watt lamp is made possible by the use of a sensitized paper with "built-in" safelight. This safelight consists of an orange dye. Negative and paper are placed in a special flexible frame that can be bent to conform with the shape of the bulb, assuring uniform illumination of all parts of the negative. After a short exposure, the print is placed in the developer, stop bath and hypo, where the orange dye is dissolved completely, leaving the finished print clear.

Feathers Removed from Poultry with Aid of Wax Bath

Turkeys, chickens and other poultry are now prepared for your dinner table on a "production line" that includes a bath in hot wax to remove the feathers. It takes fifty-three minutes to go through this line but as many as 300 cleaned turkeys can be dressed for the oven at once. As the birds start on the conveyor, larger feathers are

removed by hand. Next they enter a drying tunnel, and then are dipped into vats of wax. A cold-water spray hardens the wax, and when it is stripped off the feathers come off too. The wax is reclaimed by reheating and separating feathers from wax by centrifugal force in a rotator.

Trigger Tripod for Camera "Shoots" over Crowd

Snapshotting with one hand is as easy as firing a revolver when the camera is mounted on a pistol-grip tripod with trigger release. It is built to fit any camera having standard tripod threads and cable release for its shutter. The grip makes it especially easy to hold the camera at arm's length above the head, aim and "fire" at a subject over a crowd.



Tractor Built from Junk Parts Does Farm and Road Work

Constructed from junk automobiles, truck and tractor parts, a homemade tractor built by a North Dakota farmer pulls



Farmer driving the three-wheeled tractor built from discarded automotive vehicles

two plows at four miles per hour. The task required 200 hours of spare time. The tractor also is used on roads.

Dog Keeps Seaplane Base Clear of Driftwood

Because of the activities of a dog, seaplane pilots landing at a New York river base breathe easier. This dog, a three and one-half year old German boxer, keeps the river around the base clear of driftwood which might damage the pontoons of incoming planes. Each morning the dog takes up his watch on the seaplane ramp. Upon sighting a piece of driftwood, he plunges in and drags it ashore. Sometimes the driftwood is so large that the dog must have help in dragging it out.



Sailors Use 'Dry Ice' to Lighten Job of Swabbing Deck

Swabbing the decks is still the drudgery it has always been, but now it seems that Dry Ice may make the life of a sailor a bit easier. Technical advances have lightened other jobs, but nothing until now has replaced "elbow grease" in scrubbing away the tar that oozes from the seams on a ship's deck, especially in tropical waters. Lieut. L. F. Blodgett, commanding the U.S.S. "Whippoorwill" at Pearl Harbor, Hawaii, tried freezing the ooze by applying Dry Ice to the decks. After this treatment the tar was chipped off easily.

Eleven cable-operated streetcar lines remain in this country—seven in San Francisco, three in Seattle, one in Tacoma.

Top, dog leaps into river. Center, dragging heavy timber from the water. Bottom, enlisting help to complete the job.

Ball & Reed - I saw him at the seaplane base.

*Figia - owned by Carl Evans, dog
Duke - who keeps seaplane base
clean*

Photos by Arnold P. Photos

Trained by Willoughby

Heat-Resisting Glass Kettle for Table or Icebox



Transparent teakettle can be used for table service, for storing water in refrigerator or for boiling

Equally useful for table service and for storing water in the refrigerator, a glass teakettle has a locking lid for convenience when pouring. Water heats quickly in this transparent kettle of heat-resistant glass, and the amount of water in it can be seen at a glance as it boils.

Pouring Cap for Bottle or Can Measures Out One Ounce

One-ounce doses of top-lubricating oil for your automobile engine or one-ounce portions of fruit juices and beverages can be dealt out handily with a dispensing cap which fits on bottle or can. Pressed or



Pressing the plunger of dispensing cap measures out exactly one ounce of fluid from bottle

screwed on the container, it acts as a seal and can be left on until the can is empty. To measure out an ounce, you simply tip the bottle or can, hesitate a second to let the cap fill, then press the plunger to pour.

Radio in Cab of Freight Engine Directs Switching in Yard

Switching operations in a Swedish railway freight yard are directed by radio signals. The yard foreman operates a transmitter sending signals and telephonic orders on wave lengths between 1,000 and 2,000 meters, using varying tone frequencies for each separate switching signal. In the engine cab is a receiver with loud-speaker. The trolley wire for the electric locomotives serves as an antenna.

"Mike" in Officer's Megaphone Raises Voice above Traffic



© Hamlin of Brighton
Traffic officer at Brighton, England, gets attention by talking into megaphone with "built-in" mike

When a policeman is trying to control traffic by voice, no ordinary megaphone will do. In Brighton, England, the police use a double-acting megaphone—it encloses a microphone. The constable speaks in normal voice, yet the sound is amplified many times and it seems that he is shouting. The amplifying apparatus is in a small case usually carried over the shoulder.

There are 11,163,000 horses and mules on farms in the United States today, only half as many as in 1915.

note 10, Box 264-13, Apr 28, 1938, 10/31/38

"Intelligent Whale" Grows into Modern Sub

Streamlines were not unknown in the nineteenth century. In fact the lines of the "Intelligent Whale," that daring submersible of 1897 which failed to gain an enlistment in active service, are cleaner than those of the modern "R-10" of the U. S. Navy with its bulky conning tower projecting from the hull amidships. But submarines have traveled far in forty years. The hand-driven "whale" of '97, which could carry a ten-man crew was never adopted for service by the navy and remains a curiosity on dry land for visitors at the Brooklyn Navy Yard to inspect. The Diesel-electric submarines of today are a powerful fighting arm of the sea forces.

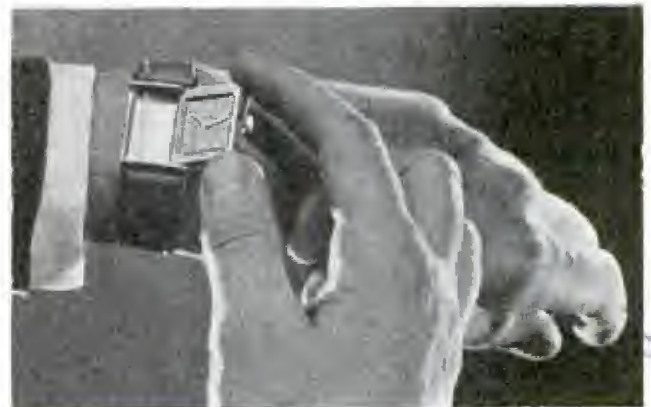


Above, the conning tower of the "R-10," modern U. S. navy submarine. Left, the "Intelligent Whale," ten-man submarine of 1897 which the navy never adopted for service.

Wrist Watch Does "About Face" to Protect Its Crystal

To protect its face from injury, a wrist watch just placed on the market is reversible. A slight pressure on one side and a flip of the finger turns the watch "about face" and locks it, dial and crystal toward your wrist and the monogrammed or decorated back facing outward.

Names and addresses of manufacturers and dealers in articles described in this magazine will be furnished by our Bureau of Information upon request accompanied by stamped, self-addressed envelope.



Flipping the reversible wrist watch "about face" turns dial and crystal toward wrist for protection.

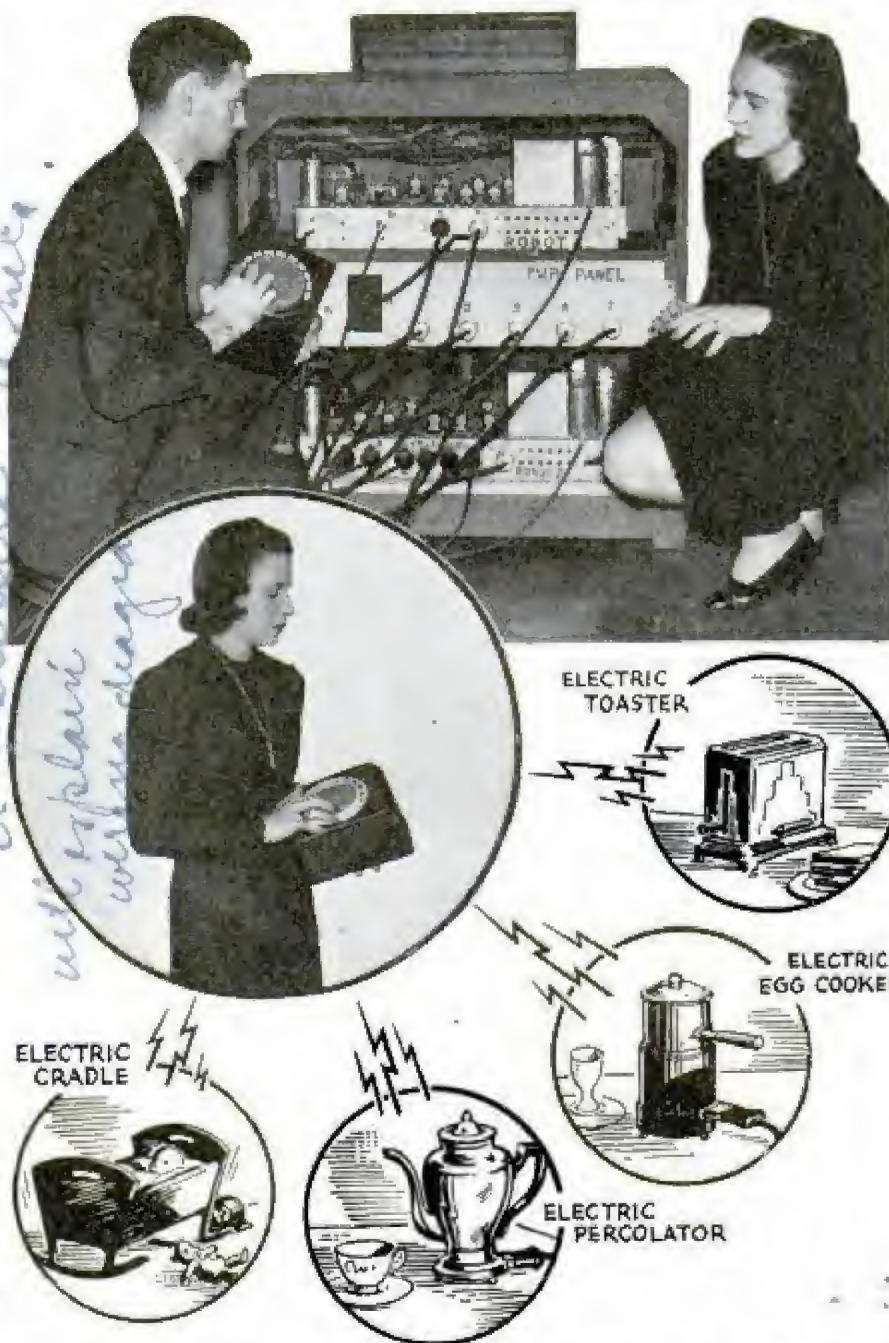
Hamilton Watch Co.
800 Broadway
New York City

Mystery Box Runs Household by Controlling Appliances

system. This is made to operate standard relays controlling such household devices as the coffee percolator, egg cooker, oven, ventilating system, or, if you please, a motor rocking the baby's cradle.

Slices of Bread Ride Through Toaster

Riding through on a small conveyor, bread is toasted as it travels in a new automatic electric toaster. Each slice is carried past the heating elements on the conveyor at just the right speed for browning. The toaster's speed equals that of a two-slice toaster of the conventional type, since it is continuous and three slices can be browning at the same time, one finishing its trip, the second in the middle of the toaster and the third just starting through. The slices are dropped from the toaster when finished, eliminating watching. Current consumption is 700 watts. A special set-screw permits setting the toaster for the exact voltage of the house current. The base is air-cooled so the appliance may be handled while in operation.



Top, keying "mystery box" to control electrical appliances. Circle, controlling appliances with the box is like using a dial telephone

Running a household by radio is no longer an idle dream. With the aid of a small transmitter, a little box with a dial, many home appliances can be operated from a distance. All things electrical in the household can be put under remote control by the magic of this "mystery" control box which is already used for tuning in and varying volume of radio programs. The box itself is a small portable transmitter which, taken to any part of the house, induces a current in the receiving end of the control



"Production line" method of making toast

Crocker Wheeler

41258. Mr. Morrill M. Hamilton.
1539 S. Beverly Glen Blvd
West Los Angeles, Calif.

Setting BUGS to CATCH

BUGS

ON THE asphalt apron of a Los Angeles airport, a silvery transport warms up for cross-country flight. The pilot awaits his signal from the dispatching tower.

"Hold up a minute," he is warned, "here comes a special rush order of 'soldiers' for New Jersey. . ."

A field attendant sprints to the plane, and gives the co-pilot a cardboard package. Then the plane slips into the air and heads east.

Thus, thousands of tiny soldiers are flown each week from their California barracks to a far-flung battle-



Top, Dr. Morrill wears gas mask in showing how eggs of grain moth are collected from cloth sacks. Bottom, examining egg card to determine whether *Trichogramma* is at work

field that extends from the peach orchards of Connecticut to the sugar-cane brakes of Puerto Rico. They are hurried eastward to help the American farmer in his never-ending war on insect pests that destroy a \$1,000,000,000 crop every year!

The Lilliputian soldiers are insects too—tiny wasps and beetles that massacre their destructive cousins of the field and forest. Entomologists call them parasites and predators. "Setting a bug to catch a bug" is a well-established practice known as biological control.

The Los Angeles laboratory of Dr. A. W. Morrill breeds parasites and predators on a commercial scale. Annually he ships between 40,000,000 and 50,000,000 eggs and insects to all parts of the United States by air express.

Helendale



Top, packing parasitized eggs. Center, eggs are carded by being sprinkled over paper covered with squares of paste. Bottom, potato room where ladybird beetles are raised

His customers are farmers, orchardists, nurserymen, agricultural experiment stations, and universities.

Insects comprise one of the largest living groups of creatures in the world. Of the 500,000 known species, however, only about 300 are actually injurious to man. The parasitic and predatory insects are important in checking the birth rate of their destructive relatives. They maintain a balance, without which the world would soon be overrun by legions of insects. Parasites usually deposit their eggs in their enemy's body, while predators kill outright by stinging.

One of the best known insect parasites is the *Trichogramma*—sometimes called the

"winged atom." This little fellow measures only one-fiftieth of an inch in length and can hardly be seen with the naked eye. Under the microscope it appears to be a tiny wasp. The *Trichogramma* is especially effective in destroying the eggs of the sugar-cane moth borer, the alfalfa butterfly, the greenhouse leaf tier, the tomato hawk moth, the corn-ear worm, the Oriental fruit moth, and many other pests. The *Trichogramma* female deposits her eggs in the eggs of the host insect, and when the wasp larvae hatch, they literally eat up the host insect's egg.

A close relative of the *Trichogramma* is a little wasp which carries the scientific name of *Microbracon hebetor*. This tiny parasite destroys the eggs and larvae of the Indian-meal moth which is a pest of stored food



products—peanuts, raisins, beans, and cereals. If 100 of these little wasps are liberated in a warehouse, they will eliminate the Indian-meal moths in a very short time.

Another doughty little insect fighter is the ladybird beetle—of which there are dozens of varieties. The *Cryptolaemus* is well known and is often called "America's No. 1 Beneficial Insect." It is black and red and about one-eighth of an inch long. Southern California fruit growers sing the praises of this helpful little beetle. About thirty years ago the citrus industry was facing complete destruction by the mealy bug, *Cryptolaemus*



Top, mealy bugs on burlap. Left, four means of shipping. Bottom, placing shipments of parasitic insects and eggs aboard air liner

was introduced from Australia and the mealy bug threat disappeared in short order. Orange and lemon associations in southern California still raise this beetle for distribution to members.

Dr. Morrill ships ladybird beetles by air to many parts of the United States where they are set against mealy bugs, thrips, aphids, and red spiders. He once saved a New York florist's stock of hot-house poinsettias by sending him *Cryptolaemus*. And once he received an order for 15,000,000 beetles!

(Continued to page 134A)



Ten-Foot Cardboard Ship Cut Out with Scissors



It's made of cardboard! More than ten feet from stem to stern, the model was cut out with scissors

With a pair of scissors for tools, a Cincinnati man has built a model ship more than ten feet long. It is a two-funnel steamer made of cardboard and paper, fashioned in great detail with masts, rigging and antennas. The same modelmaker has also cut out two ship models so tiny he carries them in a matchbox.

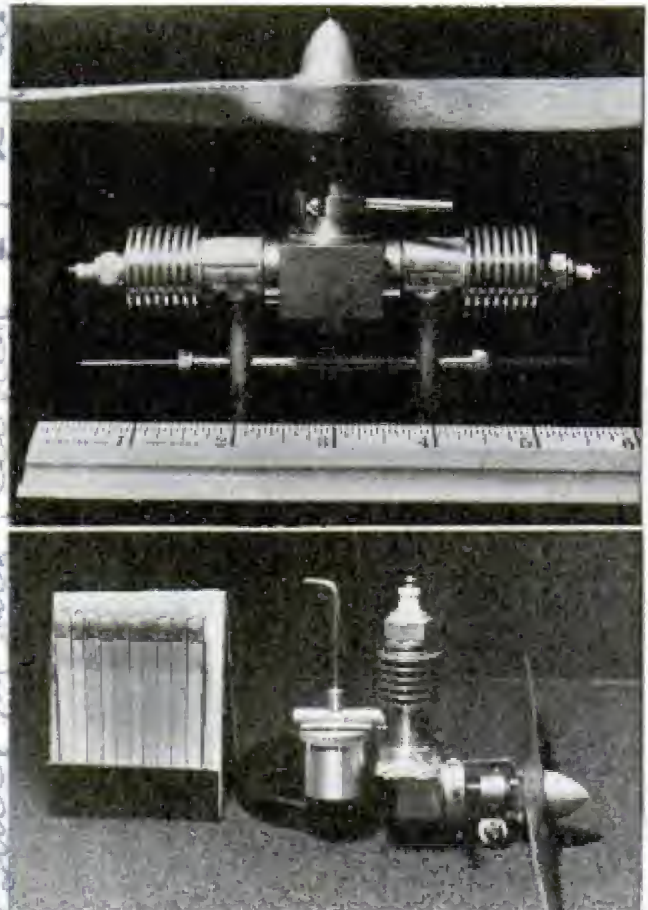
"Danger Meter" Plots the Risk of Forest-Fire Outbreak

Forest patrols can calculate the immediate danger of fire with an instrument they call the "fire danger meter." There are six factors used in figuring the hazard: season of year, fuel moisture, relative humidity, wind velocity, visibility, and activity of fire-starting agencies. These factors can

be estimated or measured by instruments, and the resulting figures are applied to the "danger meter" which automatically gives the fire risk a numerical rating on a scale of seven. A danger rating of one is regarded as negligible; four would call for average season precautions, and seven requires measures to meet extreme danger.

One-Ounce Motor Drives Plane Weighing Only Two Ounces

Among the smallest power plants in the world are the miniature engines built by a Los Angeles hobbyist. One of his tiny motors, two and one-fourth inches high and weighing only an ounce, turns the propeller of a model airplane weighing two ounces. The plane has a two-foot wing spread. At 10,000 revolutions per minute this midget motor develops about one-twenty-fifth horsepower. The same engine builder developed a two-cylinder opposed motor that is only six inches long, weighs six ounces and is rated at one-fifth horsepower. It has a speed of 9,500 revolutions per minute.



Above, six-inch opposed-cylinder motor; below, one-ounce engine for a two-ounce model airplane

Grand Coulee to Develop Watts by the Billion

Construction of the first three gigantic generators for Grand Coulee dam—three units capable by themselves of lighting Chicago and New York or supplying all the electrical needs of a city of 650,000—has begun at the East Pittsburgh plant of Westinghouse Electric & Manufacturing company. These three will have an output of 324,000,000 watts, yet they are but the first of nine main and three local generators in the west power station. The east station will have nine more main generators. Rated at 108,000 kilovolt-amperes each, thirty per cent more powerful than the largest existing generators, this initial trio will require 4,500,000 pounds of steel, nearly 300 miles of copper wire and a million man-hours of work. One hundred and forty-one tons of water per second will pass through the eighteen-foot penstock leading to the water wheels which will spin million-pound steel rotors of the generators 120 times per minute. More



Model of Grand Coulee dam and a cross section showing the eighteen-foot penstock through which 141 tons of water per second will pass

than forty years ago George Westinghouse built the first hydro-generator at Niagara Falls, then a giant developing 5,000 horsepower. Each of Grand Coulee's main generators will develop 145,000 horsepower.

Seeing World Upside Down Aids Space Perception Class



Student demonstrates how you write while wearing inverted vision glasses

Everything appears upside down to the student wearing inverted vision glasses in one university's psychology classes. The experiments with the phenomenon of inverted vision are used to teach more about space perception. Students find that one of the most difficult feats of getting about while wearing the glasses is that of walking downstairs. Stairs that lead down appear to lead up, so the wearer raises his foot to meet a downward step. A bowl looks convex instead of concave.

☐ The United States and Canada produce seventy-nine per cent of the world's autos.

El. of Vermont.

Tom G. M. C. Sharto Cook

Billiard-Ball Trick in Plane Proves Flight Smoothness



Champion trick-shot artist balances one billiard ball on top of two others in plane flying 200 miles an hour at 10,000 feet

Here's a double-balancing act for you! It's quite a feat in itself to balance one billiard ball on top of two others. Charles Peterson, world champion billiard shot, executed the stunt in a United Air Lines plane flying at 200 miles an hour 10,000 feet above Chicago. A small billiard table was installed in the transport ship for the trick. Peterson demonstrated a number of shots requiring perfect balance of the balls and smooth vibrationless, balanced flight.

Propeller Shaft Safety Brake Grips Both Sides of Drum

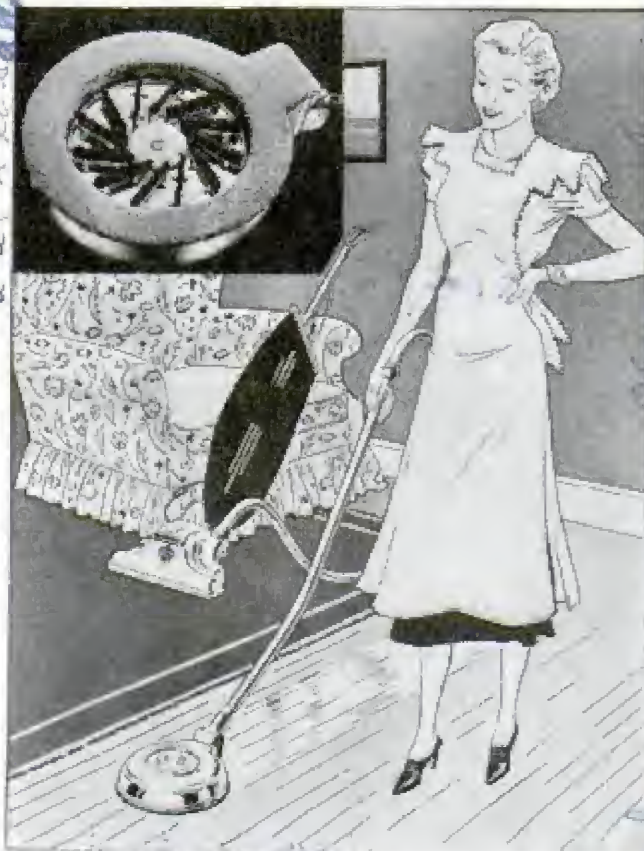


New safety for heavy trucks and buses is provided by a propeller shaft brake that grips both sides of the brake drum, instead of only the external or internal surface as do most brakes of this type. When the brake lever is applied, in-

ner and outer shoes are thrown toward each other simultaneously, gripping the drum on both interior and exterior surfaces, resulting in greater braking power with less effort and with smaller drum area. Because two-thirds of the drum is exposed to the air, rapid dissipation of heat is a feature of the brake. This results in greater efficiency and in longer life for the lining. The brake can be relined in twenty minutes.

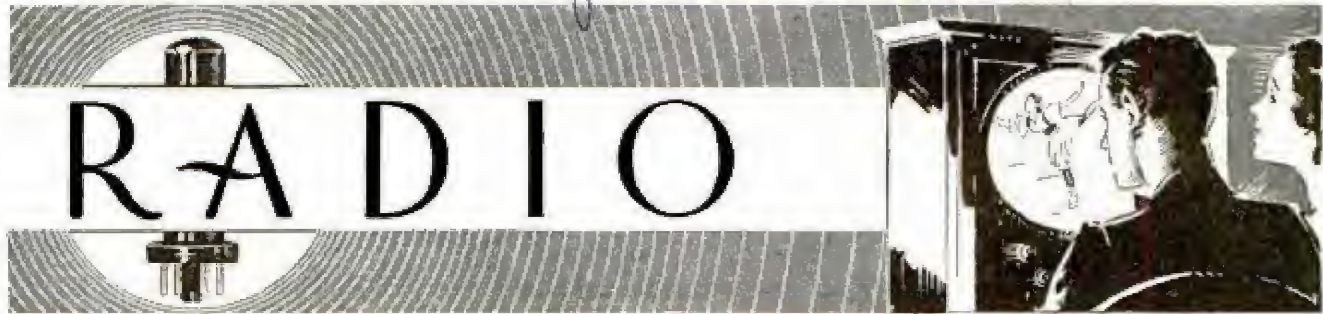
Floor Polisher Run by Air from Vacuum Cleaner

Utilizing the air pressure created by a vacuum cleaner, a new floor polisher makes easy the task of waxing floors. The floor brush is rotated by an aluminum turbine operated by the air pressure. The polisher is attached by detaching the bag from the cleaner and installing the polisher hose. Light enough to be carried easily, the polisher develops 2,200 to 3,300 revolutions per minute.



Drawing of polisher in use and connected to vacuum cleaner. Inset, underside of machine

duplicate page



TELEVISION RECEIVER KIT *for students*

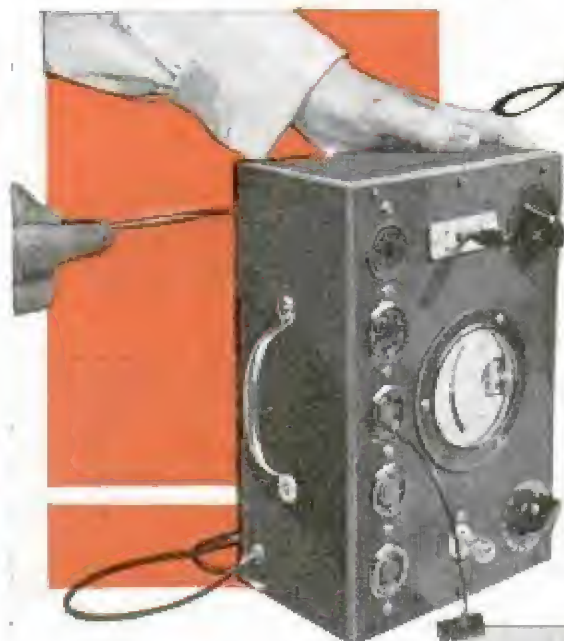
ALTHOUGH television programs are experimental and the effective range is limited to the immediate vicinity of a few large cities at the present time, many schools are adding television courses.

The video, or television, receiver and power unit shown in photo Fig. 1 was recently demonstrated by a New York radio manufacturer and is available in kit form to



students and home experimenters. It is designed for the standards of the NBC Empire State Building transmitter and the forthcoming CBS Chrysler Building station, using 441-line scanning. It is anticipated that these standards will be adhered to in other sections of the country.

In demonstrating the receiver, engineer Barnet S. Trott revealed that the set uses 15 tubes in addition to the 5-in. cathode-ray tube. The use of electrostatic instead of electromagnetic deflection in the cathode-ray tube greatly simplifies construction. The cabinet installation illustrated in photo Fig. 2 offers a suggestion for housing combined sight and sound receivers. In the opinion of the designers, this low-cost video receiver can be built easily by the average radio experimenter.



How to build a

By M. N. Beitman

HERE is that inexpensive tube tester that you have been waiting for. No costly parts or complicated wiring will be found in this efficient homemade tube checker which will test over 120 types of modern radio tubes. Following common practice in tube-tester design, the unit operates on the emission principle and will detect a faulty tube in practically every case. The sensitive short-tester checks leakage between cathode and

filament where leakage is most apt to occur.

The meter is an ordinary 0 to 1 ma. d.c. milliammeter provided with a new scale, reading half way "Bad-Good"; this scale may be hand drawn on cardboard as shown in the

CHART FOR TUBES COMMONLY USED

Tube	Fil. Switch Taps	Load Setting	Tube	Fil. Switch Taps	Load Setting
1A4	2	6.5	25A6	9	2.5
1A6	2	7.	25B6	9	2.5
1B4	2	7.	25A7	9	2.5
1F4	2	6.	25L6	9	2.5
2A3	3	2.5	25Z6	9	1.
2A5	3	3.5	19	2	7.
2A6	3	3.5	26	1	7.
2A7	3	4.	27	3	4.
2B7	3	6.	30	2	7.
5Z3	5	5.	31	2	7.5
6A6	6	2.	32	2	7.5
6A7	6	4.	33	2	6.
6A8	6	4.	34	2	7.5
6B5	6	6.5	35	3	5.5
6B7	6	6.	36	6	3.5
6C5	6	4.	37	6	5.
6C6	6	3.5	38	6	6.
6D6	6	4.	41	6	3.5
6E5	6	2.5	42	6	3.5
6T6	6	3.5	43	9	2.5
6J7	6	6.	45	3	4.
6H6	6	2.5	46	3	5.5
6J7	6	3.5	47	3	5.5
6K7	6	3.5	49	2	6.5
6L6	6	2.5	55	3	6.5
6L7	6	2.5	56	3	4.
6N7	6	2.	57	3	3.5
6Q7	6	3.	58	3	4.
6R7	6	3.	77	6	3.5
6V6	6	3.	78	6	4.
12A7	8	1.5	80	5	3.5
24A	3	5.5	83	5	5.5

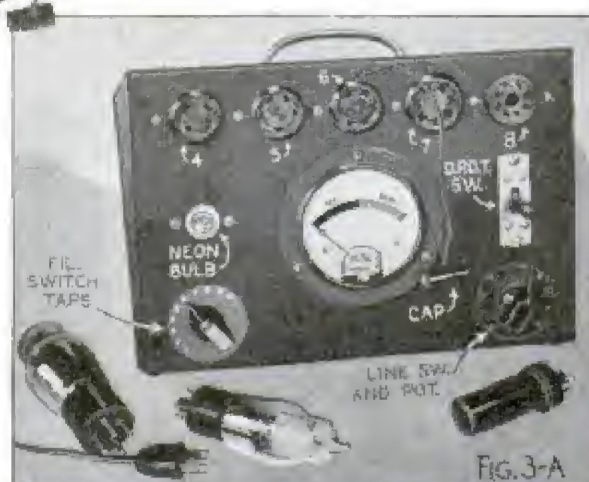


FIG. 3-A

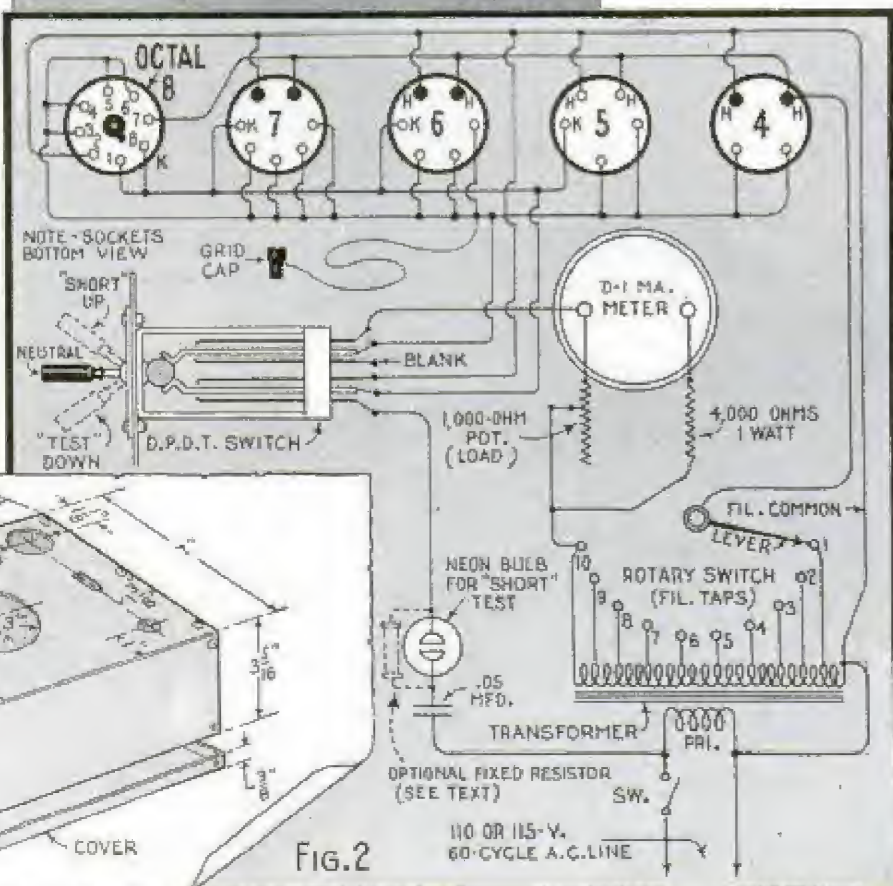


FIG. 2

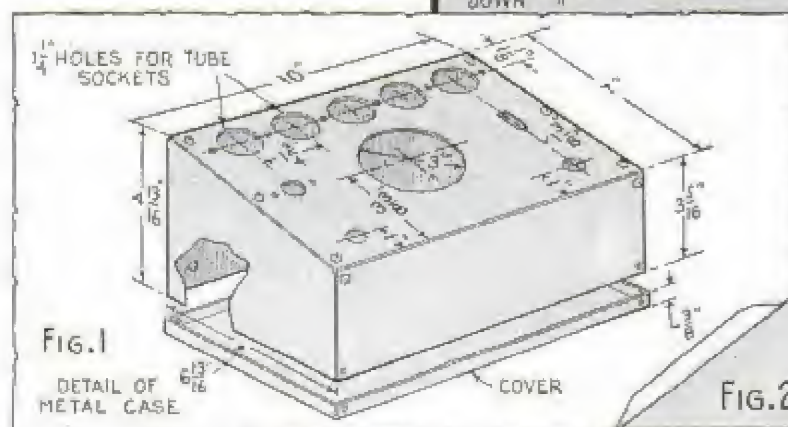


FIG. 1

DETAIL OF METAL CASE

SIMPLIFIED TUBE TESTER

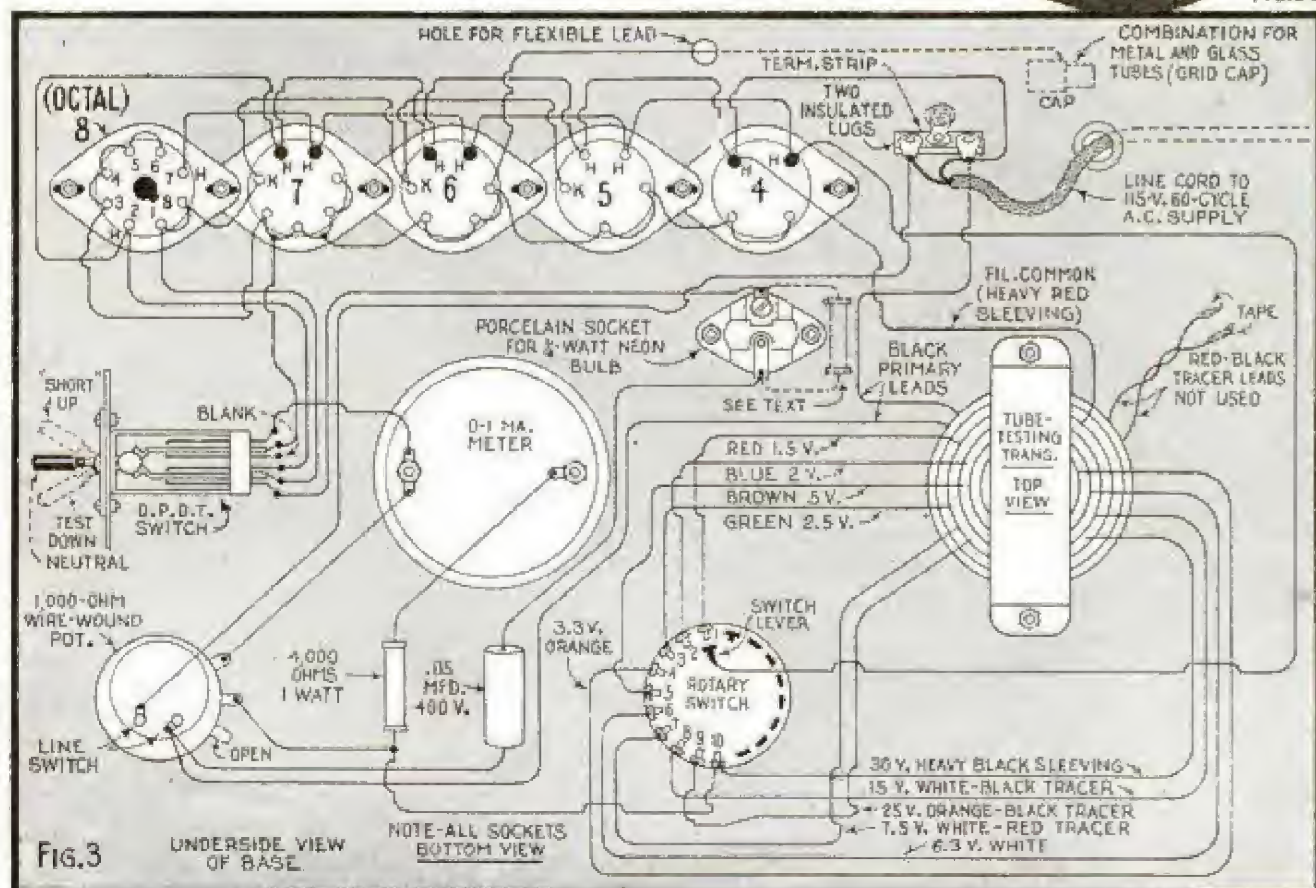
model, the "Bad" half being inked in red and the "Good" in green. This full scale length is, of course, the same as the original scale on the meter. Use the original scale as a template for cutting the new one, making sure that the holes are in the same position. Many of the parts for this tube checker can be found in the average radio experimenter's junk box, the only unusual part being the tube-testing transformer which is a standard unit and easily obtained. The unit may be operated on any 105 to 120-volt, 50 to 60-cycle a.c. line and is not critical in adjustment.

A sheet-metal case is detailed in Fig. 1; this is available formed and drilled, or any wood or metal case of similar dimensions may be used. The schematic circuit diagram is given in Fig. 2 and the simplified wiring diagram appears in Fig. 3. All parts in the underside view are shown in their relative positions; sockets of the "Amphenol" type are provided for 4, 5, 6 and 7 small and medium prong, and

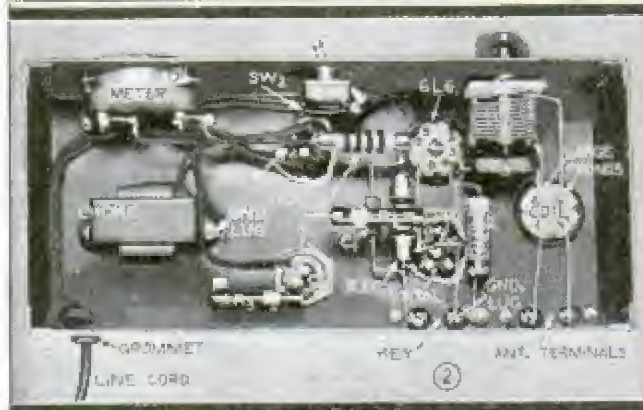
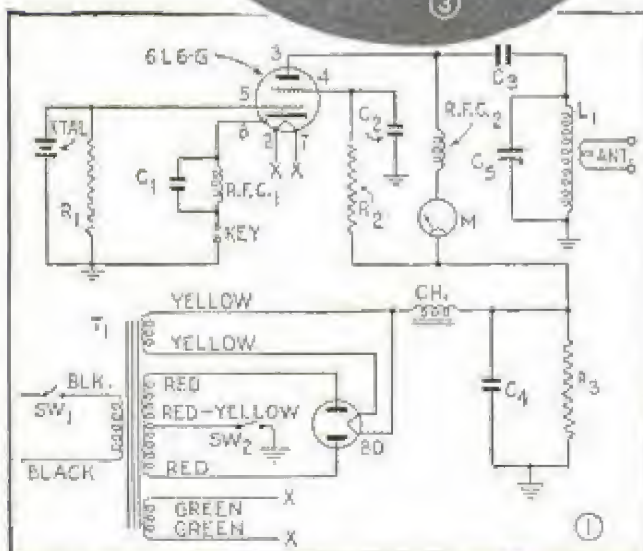
(Continued to page 136A)



FIG. 3-B



Beginner's Crystal-Controlled Transmitter



THIS simple low-power unit is designed to aid the beginner, and enables him to go on the air with an economical crystal-controlled cw transmitter that can be assembled and wired in a few hours. A type 6L6-G tube is employed in the crystal oscillator stage and a type-80 rectifier tube in the self-contained power supply.

All parts are standard and available in a complete kit which includes a Bliley crystal and coil for operation in the 40-meter cw band. With additional plug-in coils the transmitter will operate on 20 and 10 meters without changing crystals. To work on 80 and 160 meters, appropriate coils and crystals are required. The chassis base is 11 in. long, 5 in. wide and 3 in. high.

Although the input is limited to 25 watts in the form shown, this unit also makes an excellent little exciter stage if the builder wishes to add a 110-watt r.f. final amplifier at a later date. A schematic circuit diagram is given in Fig. 1 and an underside view of the wired unit appears in photo Fig. 2; complete layout diagrams are supplied with the kit of parts. The finished transmitter is shown with an ordinary key, in photo Fig. 3.

A portable kit of similar description, for operation on a 6-volt battery, is also available for motor boats, autos and trailers for mobile and emergency use. This battery-operated vibrator type has a current drain of only 9 amps., fully loaded with key down, and 1.4 amps. at standby. Operating on cw in all 5 bands in the same manner as the a.c. type described, the battery unit is a complete transmitter with built-in power supply all on a single small chassis. Metal tubes are employed in the portable battery model to withstand rough handling.

In case of accident on the farm or in rural communities where lights may go out from flood or sleet storm, or in districts where a.c. current is not available, this small battery-operated transmitter is very useful as a means of amateur emergency communication.

Practical RADIO SUGGESTIONS



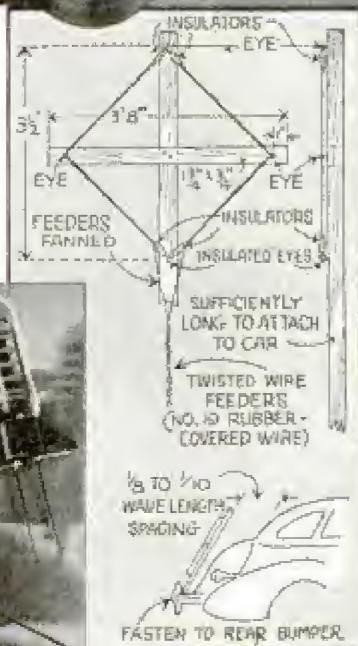
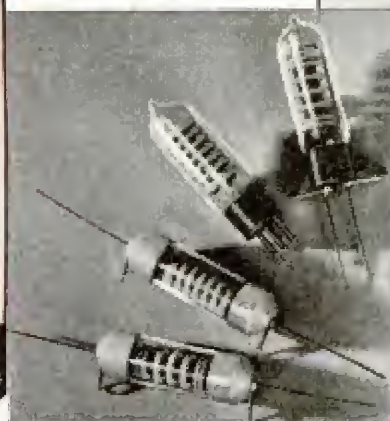
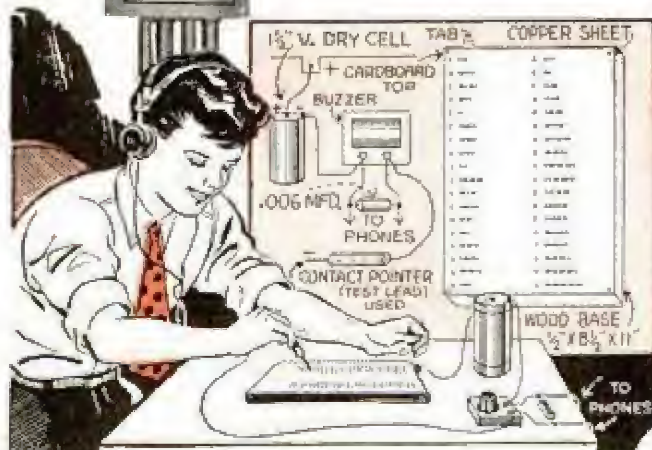
Wireless control is now available for use with any radio receiver regardless of make, size or type; merely plug this portable tuning unit into the a.c. or d.c. electrical outlet in any room in your home and tune in stations. No wiring is necessary; features include push-button tuning, remote volume control and wireless manual tuning for every broadcast station. You still can operate your set in the usual manner.



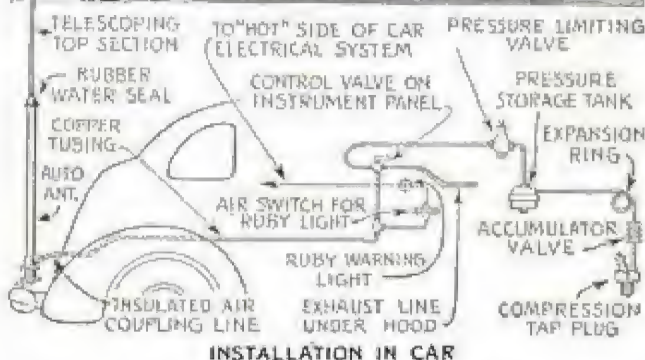
Left, vacuum-type 100-watt dummy antenna has resistance of 73 ohms to match twisted-pair lines. Enables amateurs to adjust transmitters without causing interference.



Below, left, code teacher for beginners; slots forming code letters are cut in cardboard placed over copper sheet fastened to wood base. Signals are heard as metal pointer is passed over dot and dash slots. Below, center, sealed resistors for use in marine and tropical locations; right, car body acts as reflector for directional 5-meter antenna; spacing 18 in.



Automatic Telescoping Antenna



By means of compressed air, the operator of a car or boat equipped for two-way radio, can now raise or lower the antenna to any predetermined height by merely manipulating an air valve from the driving position, thus eliminating the danger of striking obstructions.

A.C.-D.C. Test Meter Fits Pocket



Small enough to carry in your pocket, this unusually compact volt-ohm milliammeter includes all of the essential ranges for modern a.c. and d.c. set testing.

Radio World Time Indicator

By turning this simple dial, short-wave listeners can now tell just when and where to tune for any foreign or domestic radio program. It also indicates the number of hours difference between given cities, and between local time



and Greenwich mean time. A log of foreign short-wave stations is included.

Records Transmitted by Radio

You can play phonograph records through your radio set by means of this record player, located up to 20 ft. away and not connected to the receiver in any manner. A built-in oscillator "transmits" the signal.



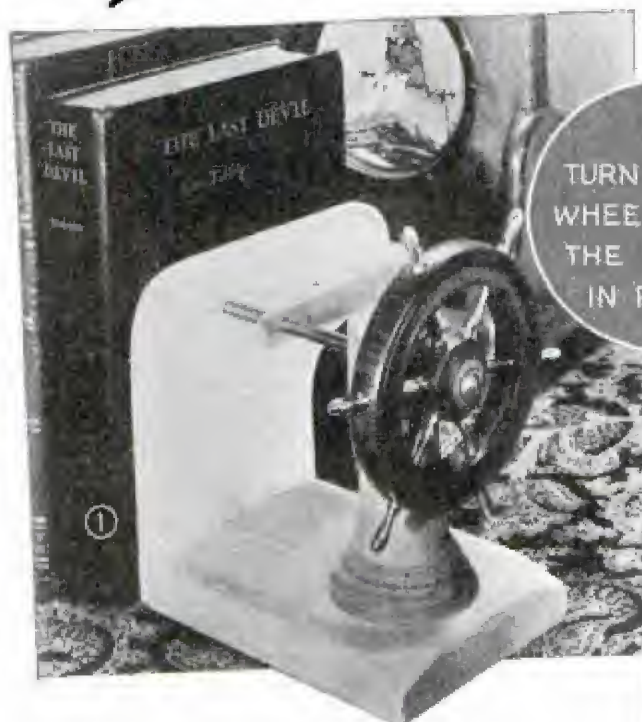
Blueprints covering radio construction articles in past issues are available for 25 cents each; original material lists and additional information can be obtained from our Radio Department without charge upon receipt of postage.

NEXT MONTH—How to Build the Little Giant Portable A.C. Phono-Radio. The 1939 improved model of this popular midget broadcast receiver is a combination phonograph and 4-tube set with 5 watts output, built into a compact carrying case.

Also—A Regenerative Preselector which will add zip to your present receiver



Ship's-Wheel BOOK END



A
TURN OF THE
WHEEL LOCKS
THE BOOKS
IN PLACE

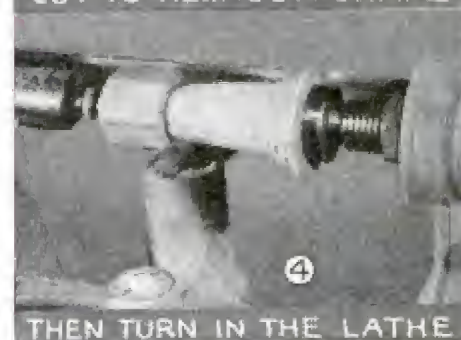


TURN the wheel of this nautical book end and a brass arm, working on a screw, slides in or out to grip or release the books. The construction is a combination of wood, metal and plastic, as you see in Figs. 1 and 2. The pedestal is sawed and turned from a short square of hardwood, and the top end is sawed to the hexagon shape required as in Fig. 3. To avoid a noticeable offset between the turned and sawed portions you have to be very careful in centering the piece, Fig. 4. The design and size of the turned section can be taken from Fig. 6. The $\frac{3}{16}$ by $4\frac{1}{16}$ -in. brass bolt will probably have to be threaded in the shop. It is grooved in the center of the portion that passes through the pedestal. A pin is fitted through the pedestal to engage the groove, thus holding the bolt in place.

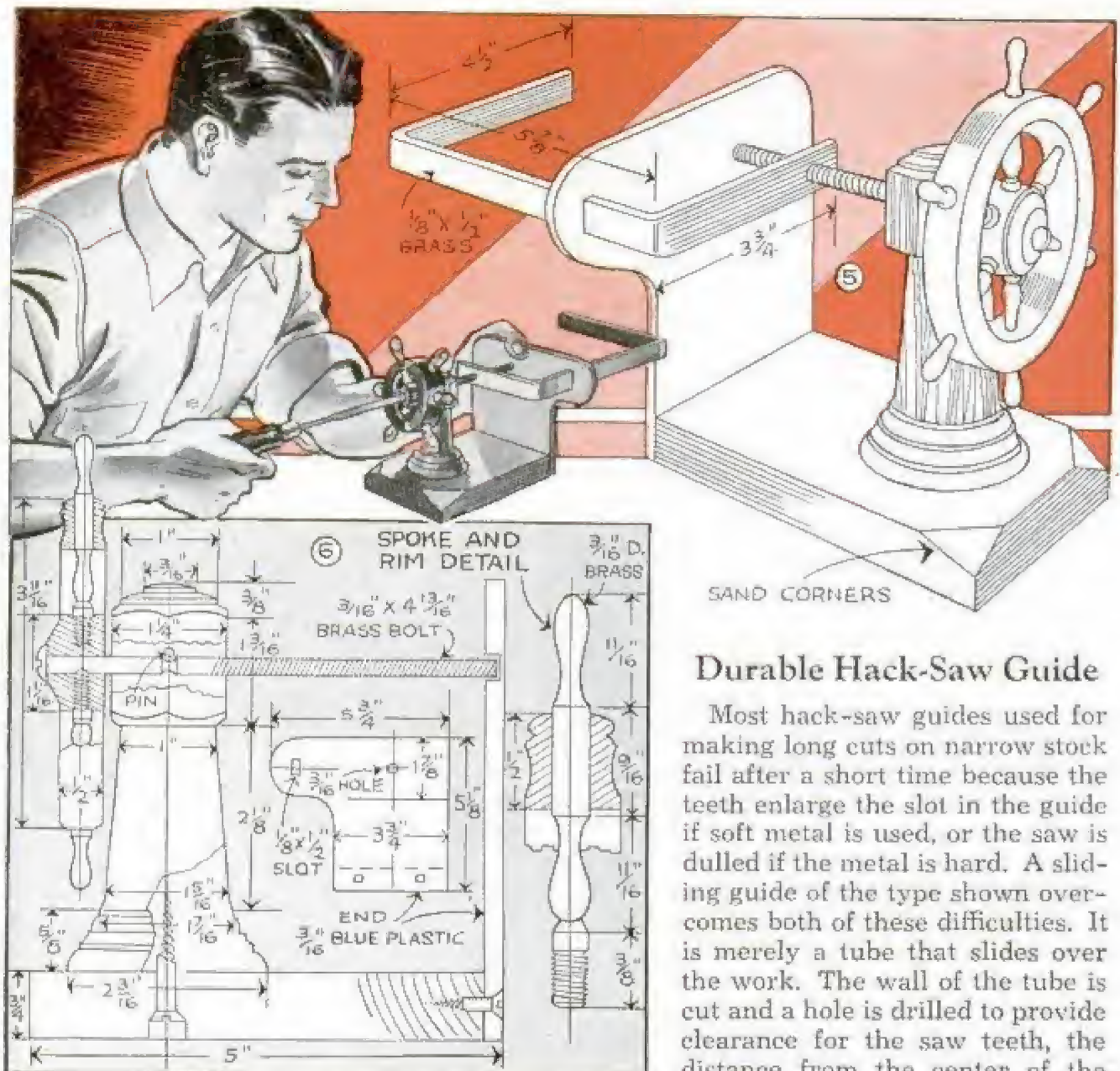
The spokes of the wheel are turned from brass rod while the hub and rim of the wheel are turned separately from hardwood and indexed for six holes each. Ends of the spokes are threaded to turn into the hub. Notice in Fig. 6 that one of the spokes is longer and is used to lock the wheel in place. Now, in Fig. 5 you



CUT TO HEXAGON SHAPE



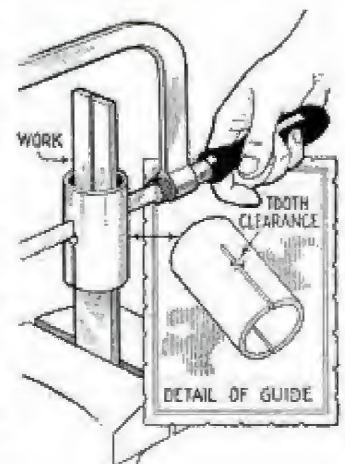
THEN TURN IN THE LATHE



Durable Hack-Saw Guide

Most hack-saw guides used for making long cuts on narrow stock fail after a short time because the teeth enlarge the slot in the guide if soft metal is used, or the saw is dulled if the metal is hard. A sliding guide of the type shown overcomes both of these difficulties. It is merely a tube that slides over the work. The wall of the tube is cut and a hole is drilled to provide clearance for the saw teeth, the distance from the center of the hole to the bottom of the slot being

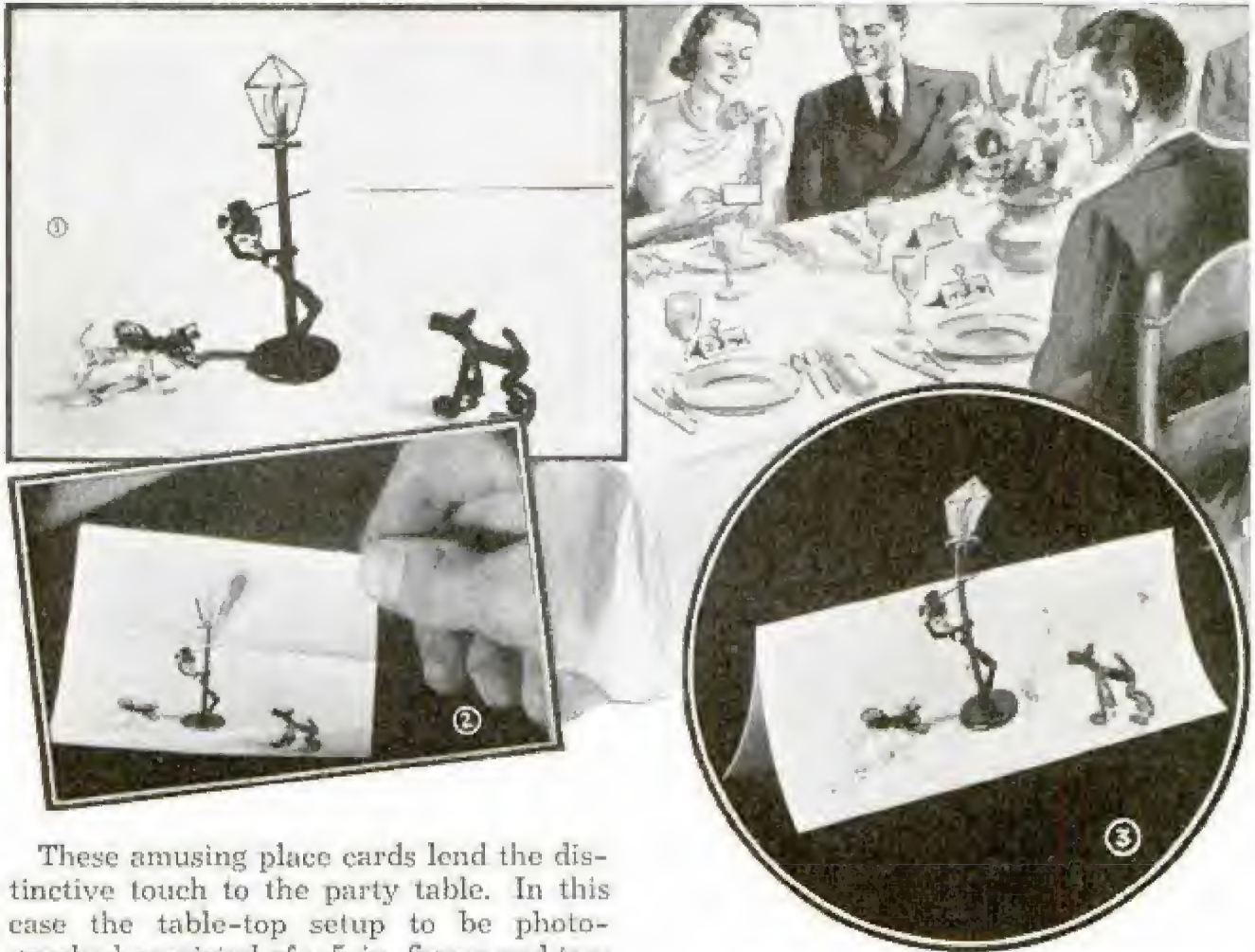
equal to the width of the saw blade. In use, the tube is slipped over the blade and the cut is started. Then the lower end of the tube slides down on the work, while the cut progresses. The guide effectively holds the blade in the correct position and the teeth never contact the guide. Of course, for each size stock, a different guide is required. Several guides of different sizes can be made and kept on hand.



will see that one end of the clamp arm is drilled and tapped to run on the threaded bolt and that the arm is moved in or out by merely turning the wheel. Of course, the arm must be bent to shape neatly and should be polished carefully and coated with clear lacquer to prevent tarnishing. After sawing the plastic to shape as in Fig. 5 the edges should be rounded and smoothed with progressively finer grades of sandpaper. The base, pedestal, and the wheel rim and hub should be hardwood such as selected mahogany, walnut or maple finished in the natural color.

❑ If cut flowers are put into lukewarm water as soon as they come from the florist during winter months, they will last much longer.

These Amusing Place Cards Are Photo Prints



These amusing place cards lend the distinctive touch to the party table. In this case the table-top setup to be photographed consisted of a 5-in. figure and two dogs bent from pipe cleaners placed in appropriate poses on a white background as in Fig. 1. After this setup was photographed and prints made, the white borders of the prints were trimmed off and the top portion of the lamp post was cut out with a

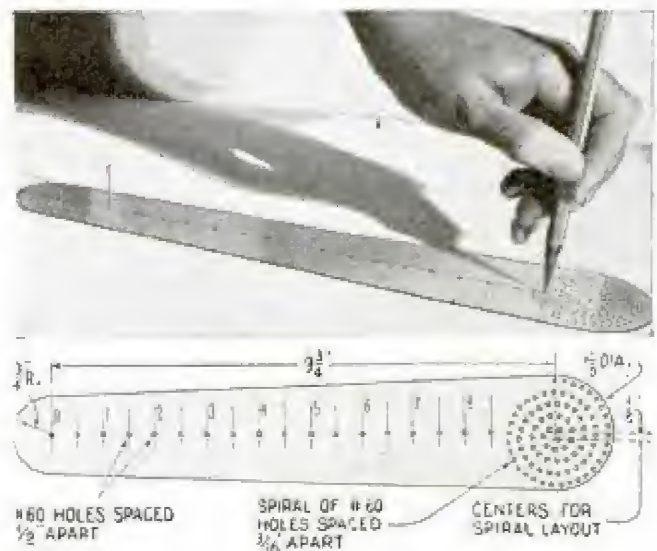
sharp knife so that it would project when the print was folded as in Fig. 2, and set on the table as in Fig. 3. Of course, the variations in the table-top setups are practically without limit.

—Ormal I. Sprungman, Minneapolis, Minn.

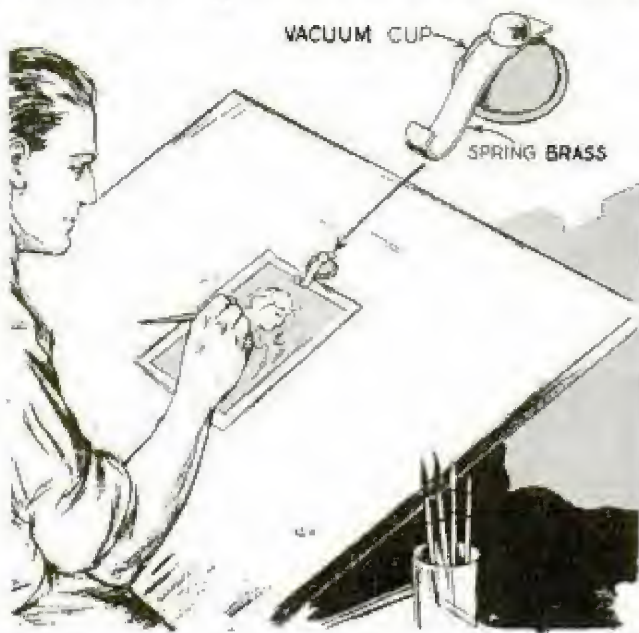
Transparent Beam Compass for Laying Out Colored Designs

Those who lay out designs involving circles scribed in different colors, will find this compass of $\frac{1}{2}$ -in. celluloid a timesaver. You just use a needle as a pivot at one end and a sharp-pointed pencil at the other to draw the lines. There's no changing of leads for each colored line as is necessary when using an ordinary compass; just use separate colored pencils. Drilling a number of holes in a spiral at the outer end of the compass was found to permit very close adjustment.—D. Reynolds, Pontiac, Mich.

Small linoleum plugs or disks can be used to fill dowel and countersunk holes in a decorative manner.

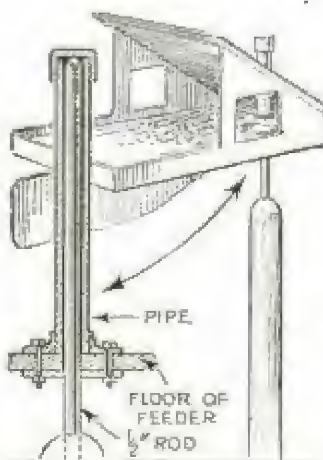


Artist Uses Vacuum Cup and Clip to Hold Paper on Drawing Board



Artists and photo retouchers who often have work on their drawing boards where it is not advisable to use thumbtacks, because of the danger in marring the work, will find that this combination vacuum cup and clip solves their problem. A short piece of spring brass is bent to the shape indicated and fastened to the vacuum cup, which should be of the type that is fitted with a stove bolt in the upper end. The clip can be located any place on the board to hold the work without damaging it.

Pivot Mounting for Bird Feeder Has "Needle-Point" Bearing



This pivoted mounting for your bird feeder is practically self-lubricating and turns easily so that the feeder always heads into the wind to keep out snow and rain. The mounting consists of a length of $\frac{1}{2}$ -in. steel rod pointed at one end

and a length of $\frac{1}{2}$ -in. pipe with a cap on one end and a floor flange on the other. The rod projects through a hole in the floor into the pipe where the point seats in

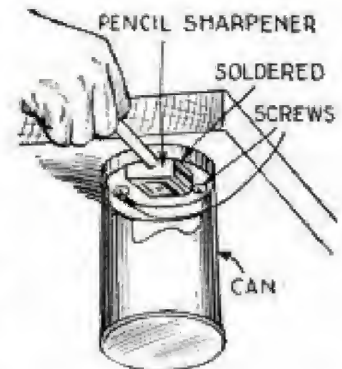
a tiny depression made in the cap with a small drill. A steel plate to take the bolts is placed on the underside of the floor to give rigidity. Heavy cup or fiber grease pressed into the pipe cap takes care of lubrication.

—W. J. Oldroyd, Waterbury, Conn.

Improved Hand Pencil Sharpener

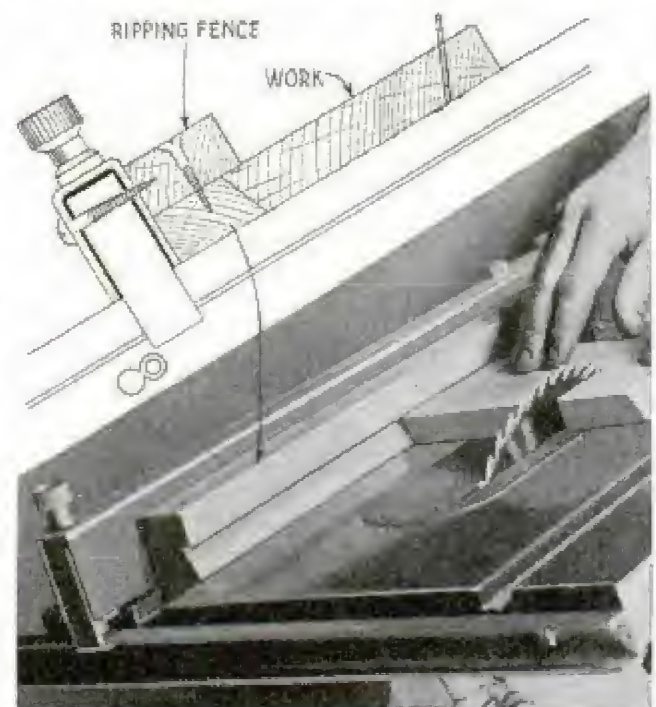
A common hand pencil sharpener may be provided with its own container for shavings. The sharpener is sweat-soldered to a can lid, which is cut away at one point to admit the pencil, a corresponding hole being made in the top part of the can. The lid is then fastened underneath the drawing board with wood screws as indicated.

—S. J. Gancher, Richmond Hill, N. Y.



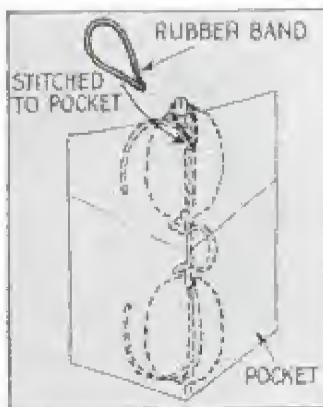
Special Rip Fence to Saw Bevels

Where stock must be ripped at a bevel on both edges, this fence on a circular saw prevents damage to the thin beveled edge already cut, while cutting the other. Also, it prevents possible twisting and conse-



quent inaccurate cutting of stock that cannot be held down firmly between the fence and saw. The fence is assembled from two strips of wood as indicated, and is screwed to the regular saw fence. The outer edge of the lower strip is beveled at the same angle as the piece being sawed, permitting the edges of both stock and fence to contact each other fully. The lower strip of the fence must be the same thickness as the work.—H. R. Heydorf, Missoula, Mont.

Glasses Held Securely in Pocket by Rubber Band



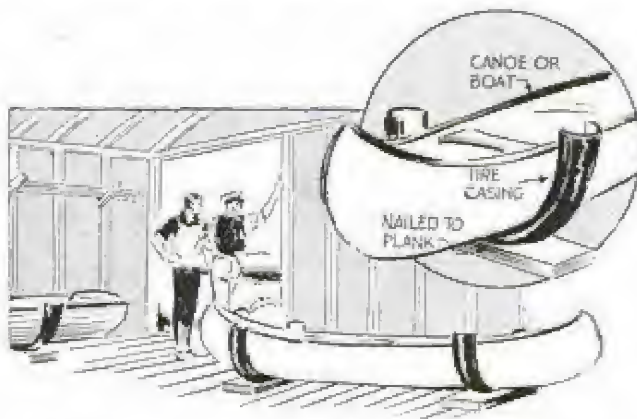
If you are in the habit of removing your glasses and dropping them in your shirt or coat pocket momentarily, try using a rubber band to keep them from slipping out when you stoop. Just stitch the band to

the upper inside surface of the pocket, and slip it over the temple hinge at one end of the lens as indicated.

—G. E. Hendrickson, Argyle, Wis.

Canoe Cradle from Auto Casing

Half sections of an auto casing nailed to planks or blocks, provide a good cradle for storing a canoe. If desired, the blocks carrying the casings can be fastened together



by means of a wood frame so that the entire assembly can be suspended from the ceiling or rafters of an outbuilding, or the cradle can rest on the floor.

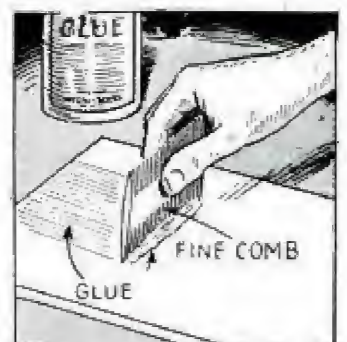
Falling Snow Imitated in Photo with Pepper on Negative



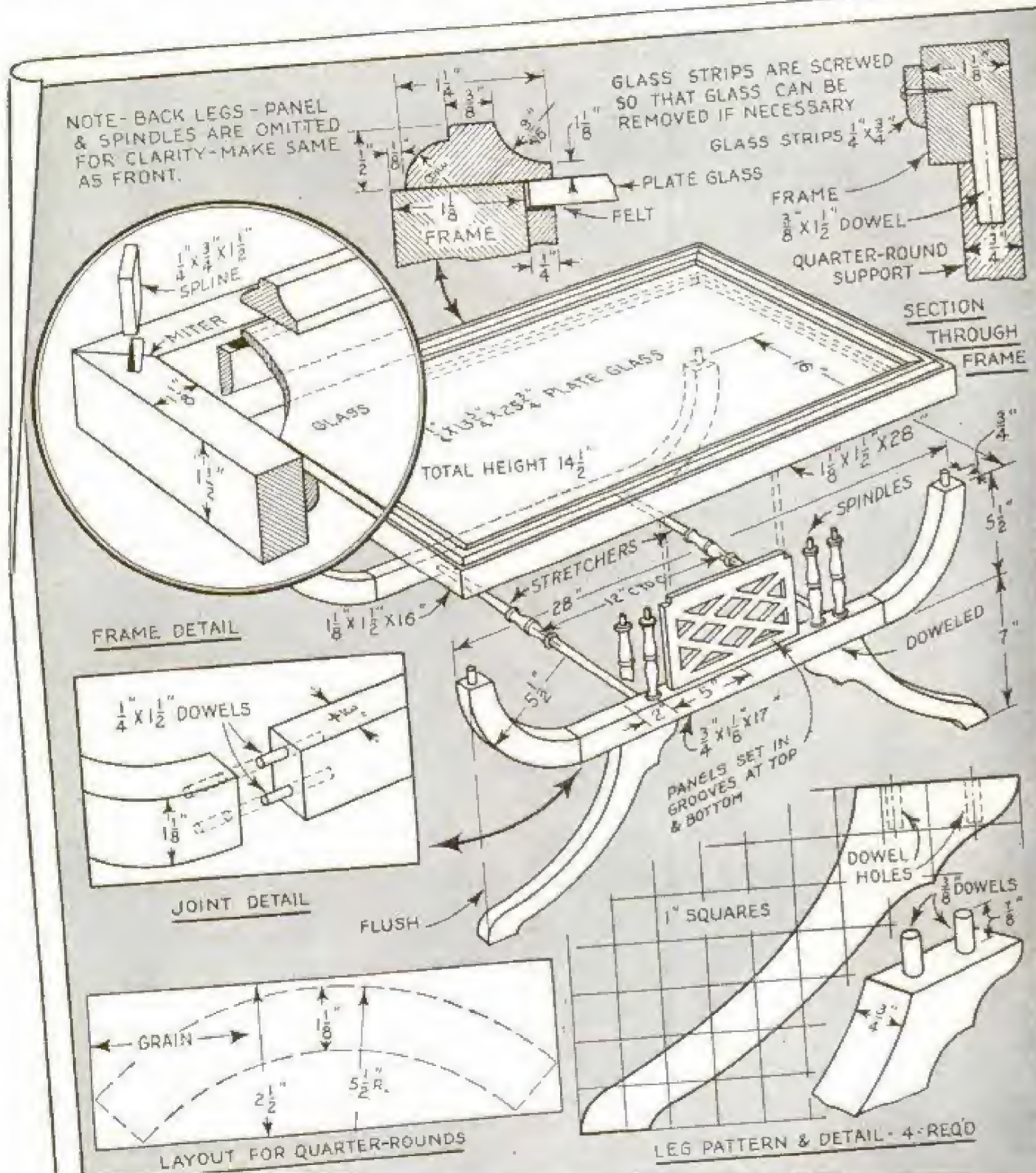
Snow scenes "shot" after the storm is over can have a touch of realism added when making the prints. With the printing frame in the horizontal position, pepper is sprinkled lightly on the negative. As snow would be visible right up to the camera, there is no need of eliminating any of the pepper from the film unless sheltered spots are included in the picture. The print is made in the usual way, care being used when placing the paper on the negative not to disturb the pepper. Stormy effects may be created by swirling the snow around buildings or other objects in the picture.

Glue Spread with Fine Comb

To apply a thin coat of glue uniformly over a large surface quickly, use a fine comb as a spreader. The comb is especially handy when working on large pieces of veneer.

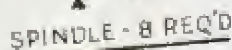
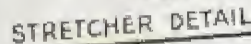


Distinctive COFFEE TABLE



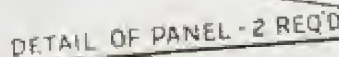
Beauty and utility are combined in this table as it is conveniently low and has a large top so that several articles may be placed on it. The bow construction does not involve bending. A glass top adds greatly to the usefulness of the piece as liquids will not damage the surface. However, the top may be plywood, Bakelite or marbleized linoleum over a wooden panel. Black walnut, birch or gumwood are suitable although walnut is easier to finish by repeated coats of linseed oil.

A black and white illustration of two women sitting at a table. The woman on the left is wearing a striped dress and a dark vest, looking towards the woman on the right. The woman on the right is wearing a red dress and is holding a small cup and saucer. A teapot is on the table.



MATERIAL LIST

2	PC. FOR FRAME	-	$1\frac{1}{8}$	X	$28\frac{1}{2}$	IN.
2	PC. FOR FRAME	-	$1\frac{1}{8}$	X	$1\frac{1}{2}$	X 16 IN.
2	PC. FOR RAILS	-	$\frac{3}{4}$	X	$1\frac{1}{8}$	X 17 IN.
2	PC. FOR QR. RDS	-	$\frac{3}{4}$	X	$2\frac{1}{2}$	X 8 IN.
4	PC. FOR LEGS	-	$\frac{3}{4}$	X	$7\frac{1}{2}$	X 10 IN.
4	PC. FOR MOLDING	-	$\frac{1}{2}$	X	$1\frac{1}{2}$	IN. BY 8 FT.
1	PC. FOR GLASS STRIP	-	$\frac{1}{2}$	X	$7\frac{3}{4}$	IN. BY 8 FT.
8	PC. FOR SPINDLES	-	$\frac{7}{8}$	X	$\frac{1}{2}$	X 6 IN.
2	PC. FOR STRETCHERS	-	$\frac{1}{8}$	X	$1\frac{1}{8}$	X 16 IN.
2	PC. FOR PANELS	-	$\frac{1}{4}$	X	$\frac{1}{8}$	X 7 IN. PLYWOOD
1	PC. PLATE GLASS	-	$\frac{1}{4}$	X	$13\frac{3}{4}$	X $25\frac{3}{4}$ IN.



3/4 x 1 1/4 x 1 1/8

3/4

BLOCKS ARE GLUED TEMPORARILY TO EACH SIDE OF PIECES FOR CLAMPING

CHISEL USED TO LIT OFF THE BLOCKS AFTER THE GLUE HAS SET

GRAIN VERTICAL

Hill Climbing on Skis Less Tiring if Hand Ropes Are Used



Many years ago when I had a job of packing mail through a hilly country in the west, I used the method shown to aid in climbing the hills on skis. Two lengths of $\frac{3}{8}$ or $\frac{7}{16}$ -in. rope were looped and fastened around the skis by one of the two ways indicated in the drawing. The looped ropes were about 40 in. long and the upper ends of both loops were held in one hand, leaving the other to carry a ski pole. The ropes alone provided good traction except when the snow was very fluffy, at which time the short stick was used.

—James D. Boylan, Ann Arbor, Mich.

Spring in Vacuum-Bottle Top Keeps Cork Tight

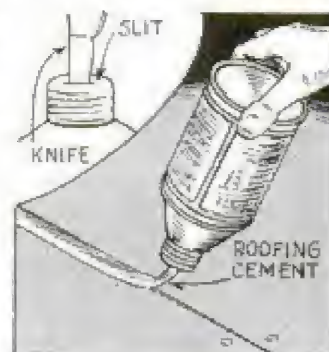


The tendency of air inside a hot vacuum bottle to expand and force out the cork is overcome by using a spring on top of the cork to press against the bottle cap when the latter is screwed in place. If pressure inside the bottle should be great enough to loosen the cork, the spring will force it back into place after

the pressure has been relieved, thus avoiding excessive leakage. The spring should be of the small spiral type and can be fastened to the cork with a couple of small staples.—W. C. Wilhite, Carlinville, Ill.

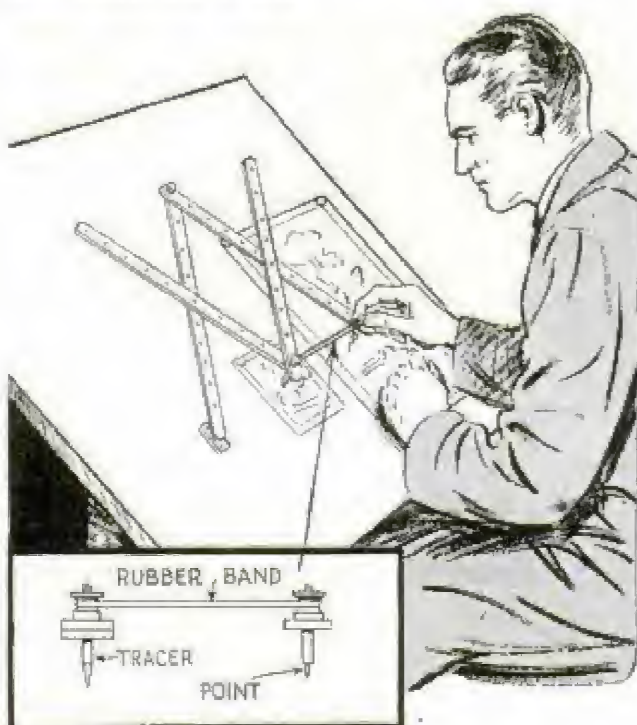
Roof-Cement Can Has Slit in Top to Apply Contents

Instead of applying cement to the seams of rolled roofing with a brush, which is usually a messy job, try cutting a slit in the can top so that the cement will flow out in the shape of a thin ribbon. With a little practice, you will find you can do a good job with less work than is necessary when a brush is used.



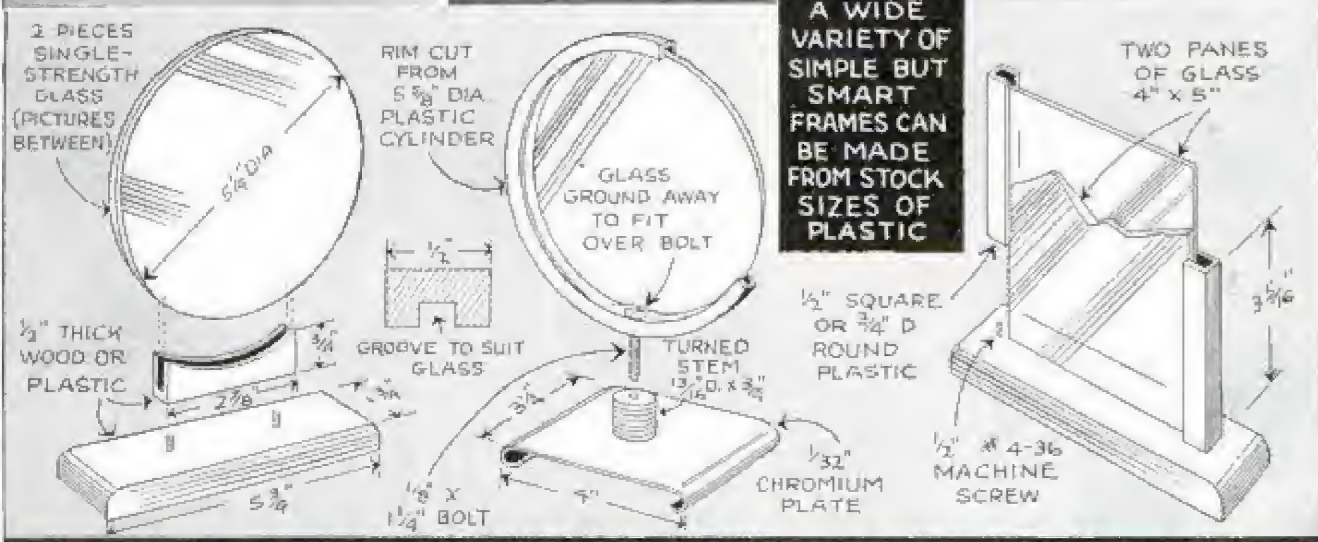
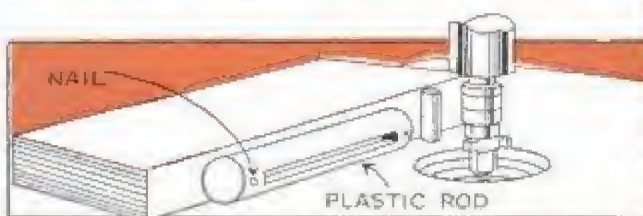
Try This When Using Pantograph

The next time you have occasion to use a pantograph you'll find it will operate much more smoothly and accurately if a rubber band is stretched between the tracer point and the lead point of the arms. The tension formed by the rubber band eliminates the "jerky" motion and also prevents wobbling once the pivot joints have become worn.



Two-Way DESK FRAMES for your Photos

Easily made from colorful plastic or selected cabinet woods, these attractive desk frames offer a distinctive touch to "home portraits." Two panes of single-strength glass are used, the two pictures being fitted between them, back to back. The frame which holds the glass is rabbeted. Where round columns are being worked, the job is simplified by cutting the plastic rod oversize so that it can be nailed to the edge of a wood block, as shown in the drawing below. Crystal plastic, $\frac{1}{8}$ in. thick, makes a good glass substitute, especially for circles or intricate shapes

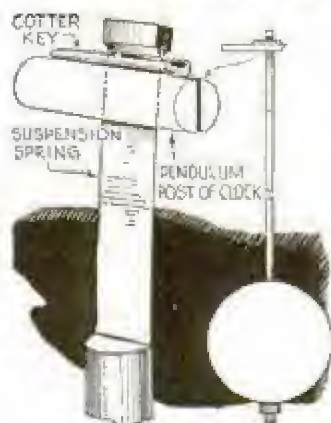


Usher's Flashlight on End of Cane Handy to Locate Lost Articles



An usher in a theater who often has to retrieve articles lost or misplaced under the seats by patrons, taped a flashlight to a cane so that he can throw the beam of light on the floor between and under the seats without unduly disturbing the occupants. In this way, maximum illumination is obtained where needed and it requires only a few minutes to make a search.

Cotter Key Lifts Pendulum to Renew Life of Clock

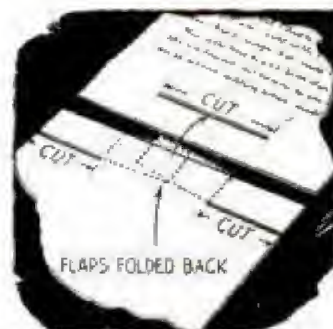


When a pendulum clock ceases to function properly for no apparent reason except age, it is possible that its usefulness may be renewed by raising the pendulum spring in the split post from which it is sus-

pended. The bend of the spring, when the pendulum is in motion, is thus applied to a stiffer portion of the metal. The lifting and fastening of the pendulum may be accomplished quickly by merely slipping a small cotter key over the spring between the split post and the attached stop.

Clippings Fastened Together without Paste or Glue

Two newspaper clippings can be fastened together without the use of paste by following this method: Leave a good margin at the bottom of one clipping and at the top of the other. Slit the first at the center near the bottom and then cut in from the edges of the second to make a couple of flaps. Fold these over, slip them through the slit and then unfold them, which locks the clippings together.—Don W. Sigler, Lincoln, Nebr.



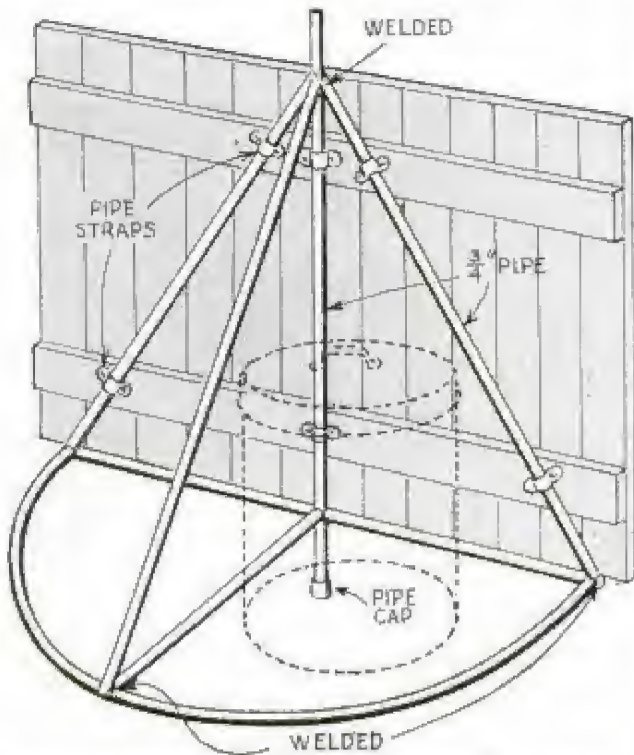
Printing Masks of "Cellophane" a Cure for Fuzzy Edges

If the edges of your photos are fuzzy, the trouble is probably caused by using a heavy mask which prevents good contact between the paper and negative at the edges. This may be eliminated by using masks made of red Cellophane. It is sand-



wiched between two sheets of paper and an opening of the desired size cut with a razor blade, using a piece of cardboard or a ruler as a guide.

Swinging Platforms Conceal Garbage Cans

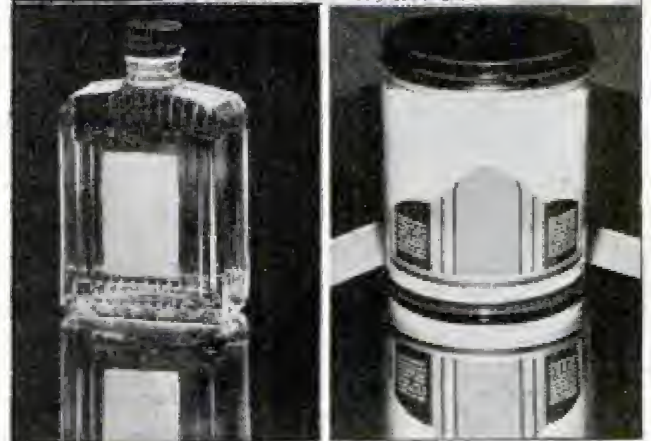


Besides effectively concealing unsightly garbage cans from view, which often detract from the appearance of a neat back yard or garden, the provision of a swinging platform and a dummy wall section enables the home owner to keep the cans where dogs cannot get at them. You can build a small shed against the house or garage for this purpose, and make the platform large enough to hold two cans. Or, in some cases the space under a high porch might be utilized

Ferrotypes Plates to Produce Good Reflections in Photos

Instead of setting a small object on a mirror to photograph it for novel reflection effects, I use either a chromium or black ferrotypes plate. The chromium plates are preferable as they have a tendency to eliminate undesirable reflections of other objects in the room. Also, when the plates are used for this purpose no space will show between the object and its reflection, as is often the case when a mirror is used, owing to the thickness of glass between the top surface of the mirror and its undercoating of silver. It is necessary, of course, that the plates be free of scratches and thoroughly clean and dry.

—Arthur Trauffer, Davenport, Iowa.



❏ If the yolk of an egg breaks when separating it from the white and mixes with the latter, you can remove it with a cloth dipped in cold water; the yolk will stick to the cloth.

Foot-Operated Switch Controls Electrically Driven Tools



Good use can be made of an auto starter switch in controlling electric motors on lathes and other tools where frequent starting and stopping are necessary. The switch is cut in one wire of the extension cord on the motor and operates the machine as long as it is held down with your foot. A metal block is best for housing the switch, although a wood block bored as indicated in the detail can be used, if the opening to take the switch is lined with sheet asbestos or thin sheet metal. Also, it's a good idea to use a fiber or metal sleeve where the wire enters the block.

—Harry R. Carr, New Milford, N. J.

Suspension Wires in Photo Work Smoked to Avoid Showing



Wishing to suspend an object from wires against a dark background, one photographer covered them with black soot so that they would not show in the photo. This is

better than using paint, as the smoked surface does not reflect light and can be removed easily with a cloth. Small pieces of rosin placed at the base of a candle flame produce black smoke that adheres to the wires.

Drip Catcher on Umbrella

No matter how much you shake an umbrella, after folding it when you come in out of the rain, there are always a few drops that run down on the floor. This water can be collected in the catcher shown, which is nothing more than a rubber spark-plug protector slipped over the end of the umbrella shaft.

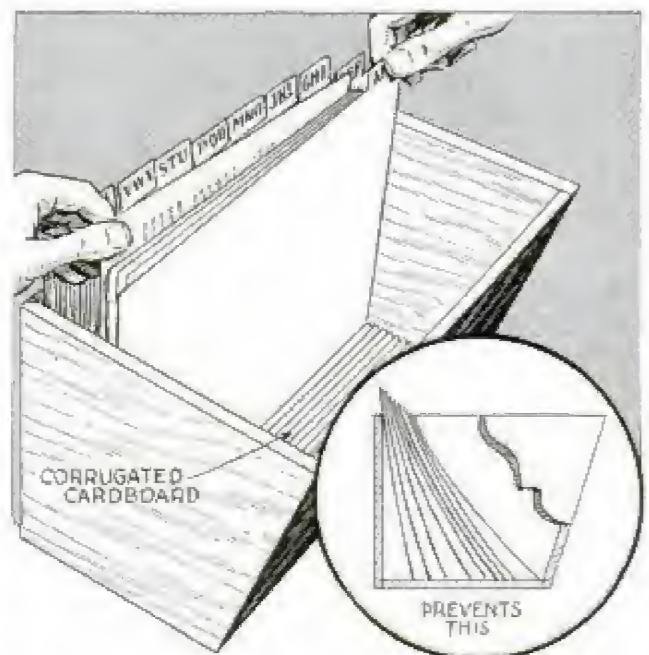
—Frank Bentley, Clinton, Iowa.



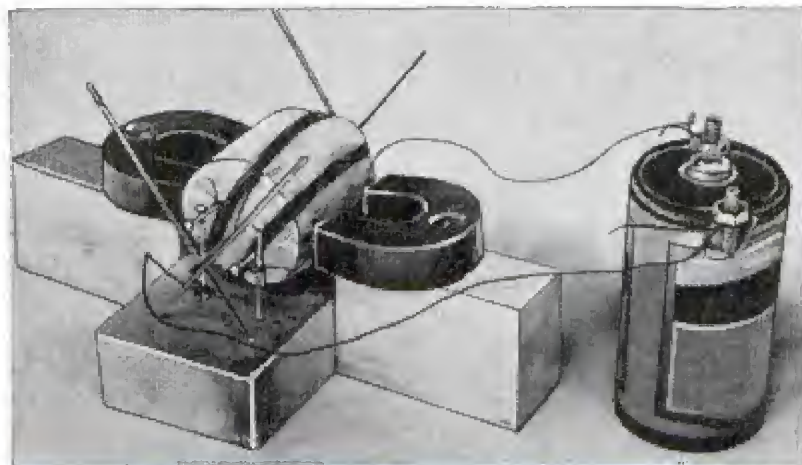
Non-Skid Bottom in File Tray Keeps Folders in Position

Placed in the bottom of a file tray or file-cabinet drawer, a piece of corrugated cardboard will keep the folders from sliding along the bottom. You will find this idea especially handy in long file trays or cabinet drawers where folders tend to slip out of a vertical position.

—Ronald Eyrich, Milwaukee, Wis.



Fifteen Minutes to Build **this ELECTRIC MOTOR**



All ready to go! With horseshoe magnets acting as field coils a flashlight dry cell turns the armature at considerable speed

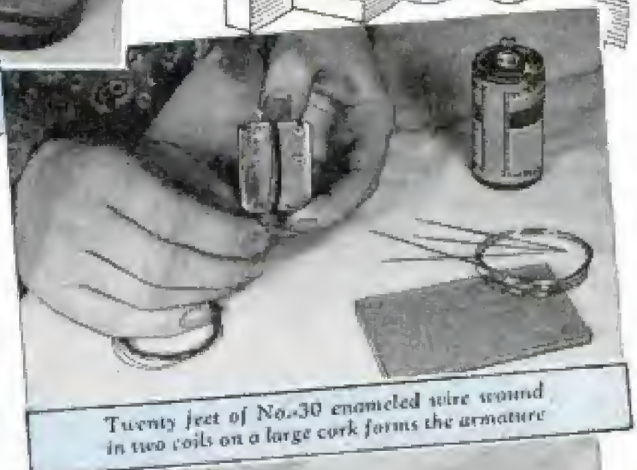


By J. P. DRISCOLL

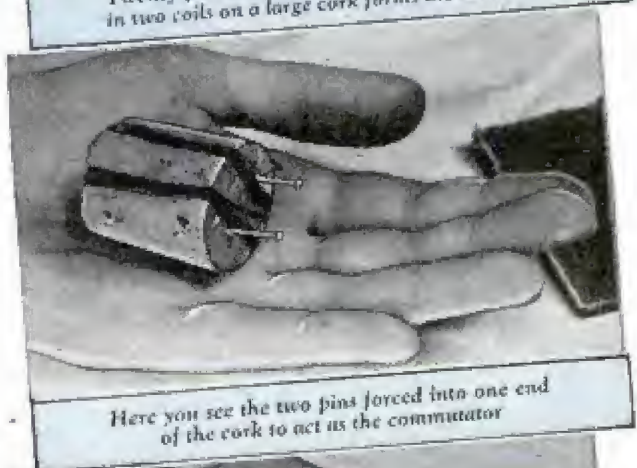
YOU can make this tiny, simple motor from material available almost anywhere. If the motor has been properly assembled, a small dry cell of the flashlight type will provide sufficient current to run it at considerable speed. And, although the motor does not provide enough power to operate other toys, it is instructive to the junior electrician as it demonstrates basic laws of motor operation and will afford hours of fascinating play.

All you need is a large straight cork for the armature, two small horseshoe magnets to serve as the field poles, five darning needles for the shaft and shaft bearings, four pins to form a simplified commutator and brushes, twenty feet of No. 30 enameled magnet wire and three small wooden blocks.

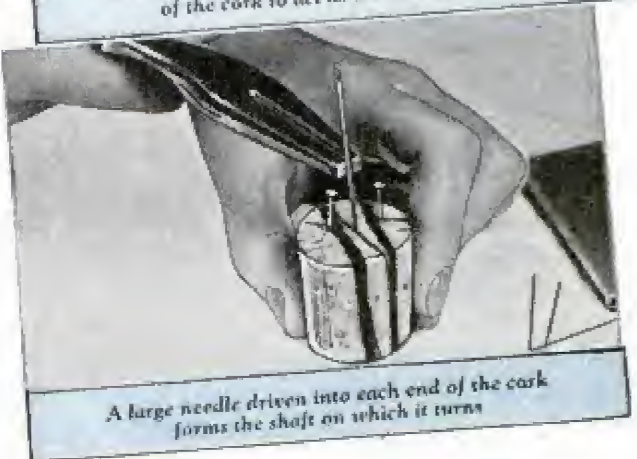
The first step is to drive two pins into the end of the cork diametrically opposite each other on a line marked on the end through the exact center. These pins must be located the same distance from the edge of the cork to keep the latter balanced as much as possible. When the motor runs, the pins on the armature revolve in the space between two pins driven vertically into a block, and must lightly wipe against the latter to permit electric current to be



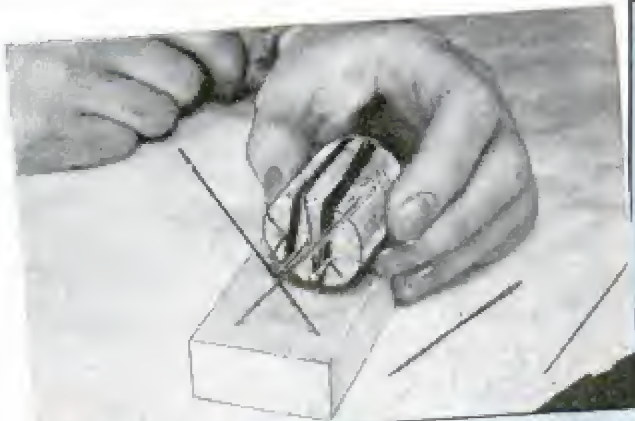
Twenty feet of No. 30 enameled wire wound in two coils on a large cork forms the armature



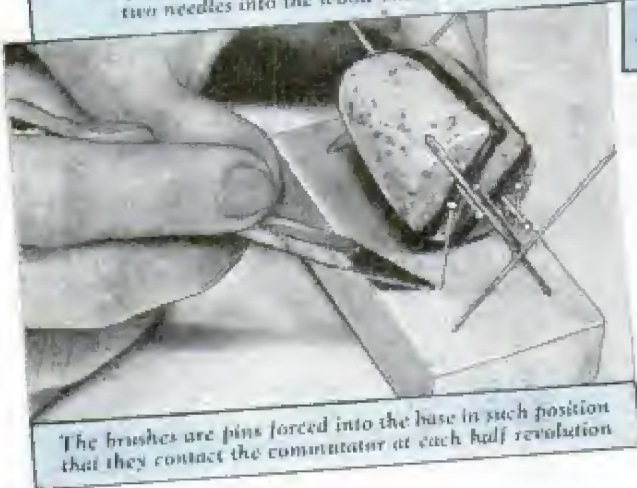
Here you see the two pins forced into one end of the cork to act as the commutator



A large needle driven into each end of the cork forms the shaft on which it turns

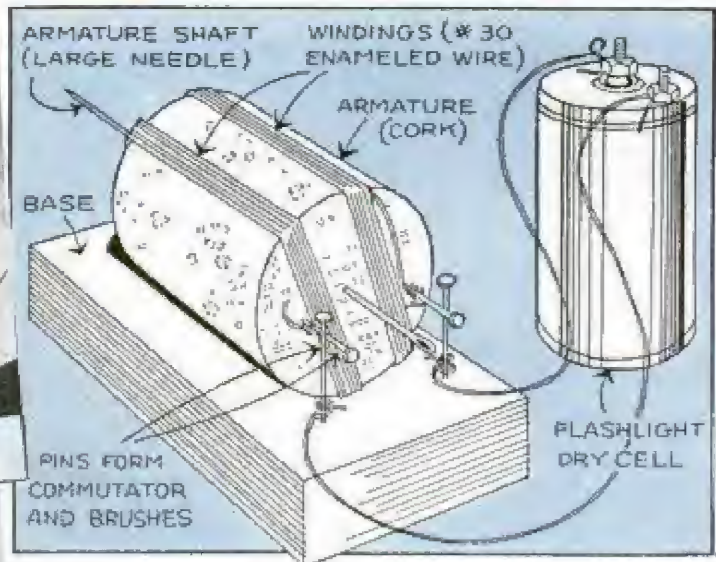


Simple non-friction bearings are made by driving two needles into the wood base at an angle



The brushes are pins forced into the base in such position that they contact the commutator at each half revolution

conducted to the armature winding, which is next wound on the cork in the position shown. Half of the wire is wound to form one coil, the wire is then crossed over and the winding continued in the same direction to form the second coil. It is important to get the same number of turns in each coil and to space the coils the same distance from the center of the cork in order to maintain balance. You can facilitate matters in this respect if you use a pencil and a ruler to lay off the location of the coils on both ends of the cork, just inside of the pins. Before winding, the end of the wire is scraped carefully for a distance of about one inch to remove all traces of the enameled covering. The cleaned end is wound around one pin to obtain good electrical contact and the winding is then started. Pushing a darning needle through the exact center of the cork as indicated, which can be done with a pair of pliers, provides the shaft and completes the armature assembly. Then two pairs of darning needles are forced into the armature support block to form bearings, each pair of needles crossing each other, making a crotch in which the armature shaft rotates.

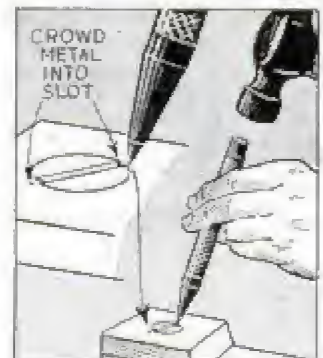


The motor is now practically completed. You may snap a rubber band around the center of the cork to hold the coils in place as these might shift on account of centrifugal force when the armature rotates fast. Field poles are two small horseshoe magnets placed on wooden blocks set on each side of the armature. The pole faces of each magnet should line up parallel to the shaft and should be stationed as closely as possible to the side of the cork, allowing very little gap.

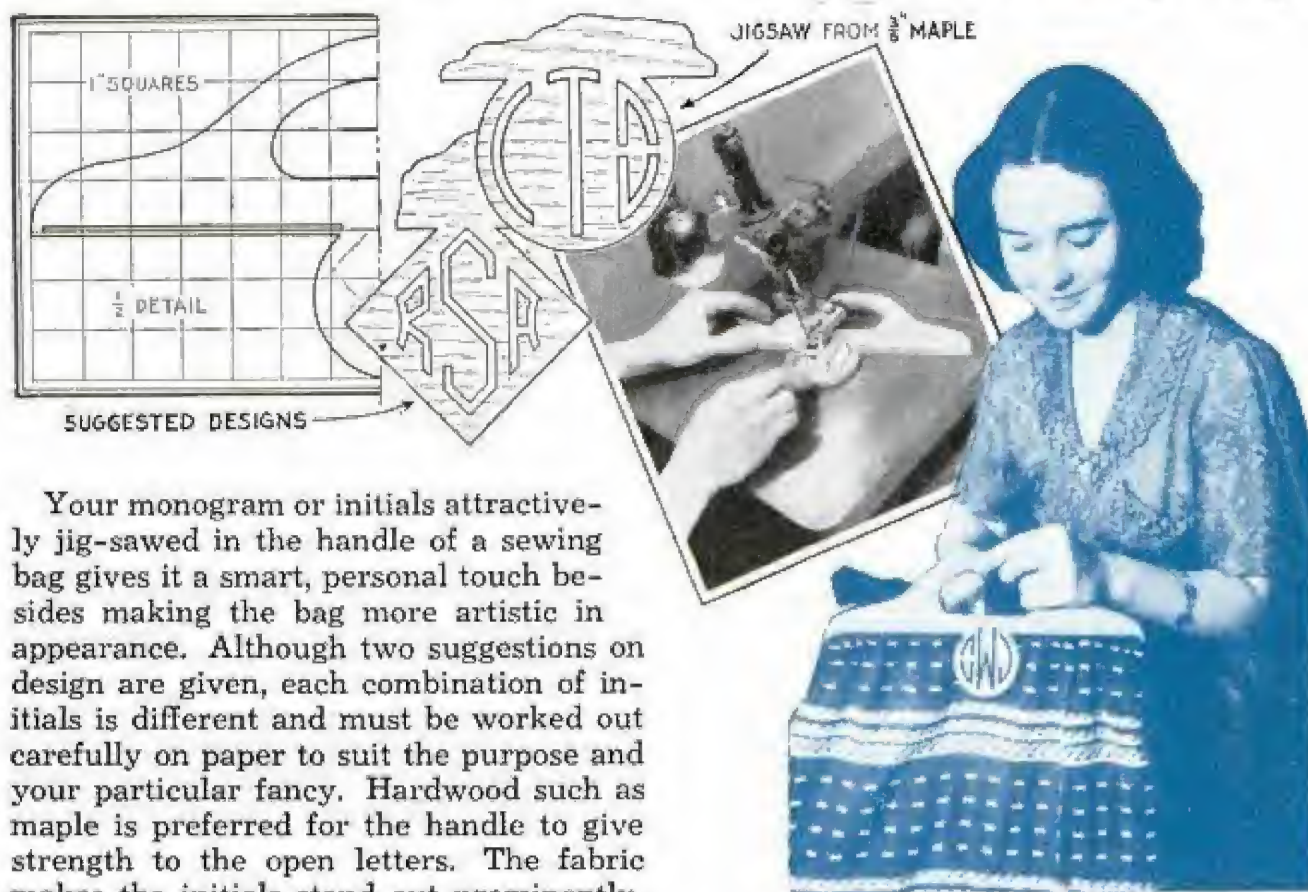
Before connecting the dry cell to the motor, you will have to examine and adjust the commutator and brushes. Only a slight wiping contact is required, and it is best to drive the brush pins lightly into the block so that there will be a little "give" when the commutator pins contact them. One dry cell is sufficient but greater speed is possible if two dry cells are connected in series. Direction of rotation is changed by reversing the connections to the dry cell.

Locking Machine Screws in Place

A countersunk machine screw can be locked in place by forcing some of the surrounding metal into both ends of the slot with a sharp punch. You'll find this method more reliable than the conventional one of punching around the head of the screw.



Initialed Handles to Personalize Sewing Bags

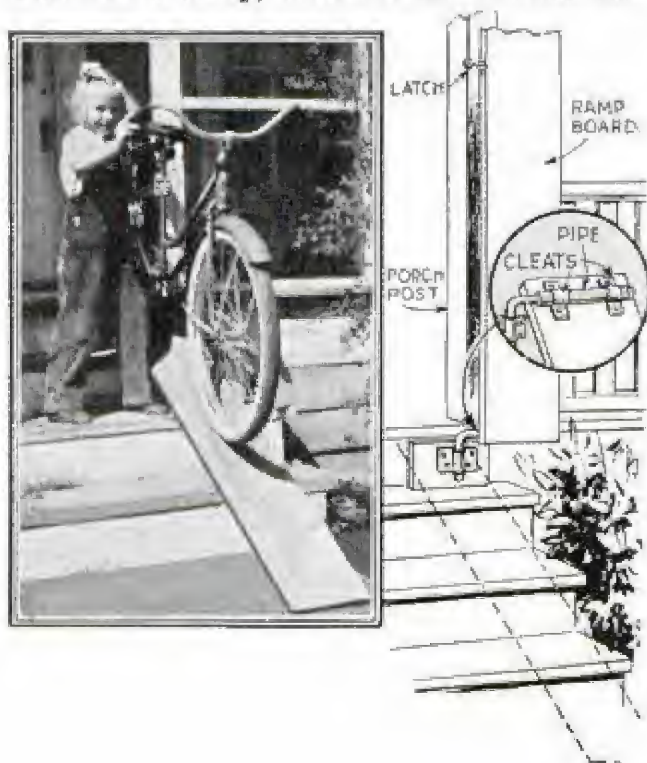


Your monogram or initials attractively jig-sawed in the handle of a sewing bag gives it a smart, personal touch besides making the bag more artistic in appearance. Although two suggestions on design are given, each combination of initials is different and must be worked out carefully on paper to suit the purpose and your particular fancy. Hardwood such as maple is preferred for the handle to give strength to the open letters. The fabric makes the initials stand out prominently.

Bicycle Ramp above Porch Steps Is Swung Out of the Way

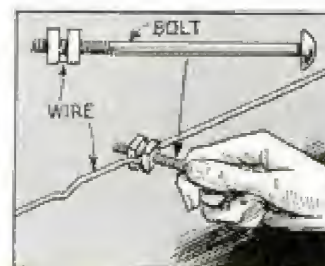
Where bicycles are kept on a porch, children will find it easy to take them up or down the stairs if a plank is provided to serve as a ramp, which reaches from the

porch floor to the sidewalk. It is pivoted at the upper end by means of an L-shaped rod, which fits in a pipe bearing fastened to the underside of the board by means of pipe cleats as shown in the circular detail. The other end of the rod pivots in a cleat fastened to the side of the porch just below the floor boards. This arrangement allows the assembly to be swung against a porch post, out of the way.



Wire Tightened with a Bolt

To tighten a strand of wire when no tool is at hand, run a couple of nuts on a long bolt, so that the space between them will be a little wider than the diameter of the wire to be tightened. In use, set the nuts astraddle the wire and give the bolt a twist to one side.



C-Clamp Handles Easily Applied to Empty Oil Drums

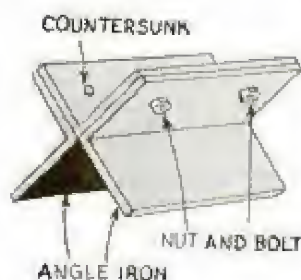


When using an empty oil drum to carry wood and other materials around the home, I apply a couple of large C-clamps to serve as handles so that two men can carry it conveniently. The clamps are fitted over opposite sides of the drum as indicated. This method, of course, is only suitable when the weight of the drum is not heavy enough to spring the clamps.

—Roger W. Lindemann, Chicago, Ill.

V-Blocks from Angle Irons

Amateur craftsmen and others who have need of V-blocks, and accuracy is not critical, can assemble inexpensive ones from



angle iron. Three pieces are needed for each block, which can be made any length desired. Assembled with small bolts, the irons are fastened together so that their vertices come together as indicated, the screw heads being countersunk. If the fillet of

the angle iron is too pronounced, as is usually the case, use the vee formed by the junction of the three pieces.

the angle iron is too pronounced, as is usually the case, use the vee formed by the junction of the three pieces.

Tripod Support Made Rigid with Spring

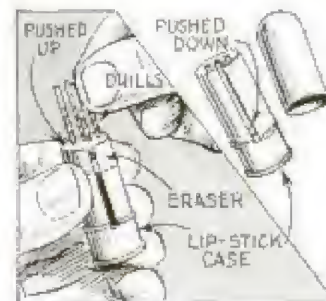
Here's a simple way to improve tripods that have friction braces, which often slip out of place when the tripod is moved slightly. A small coil spring is fastened to the brace

at one end and to the tripod leg by means of a screw eye at the other as indicated in the photo. This idea is especially handy for newspaper photographers who keep their tripods assembled most of the time.



Pocket Case for Pin Drills

Small pin drills that are likely to be lost can be stored in an empty lipstick container, which permits them to be



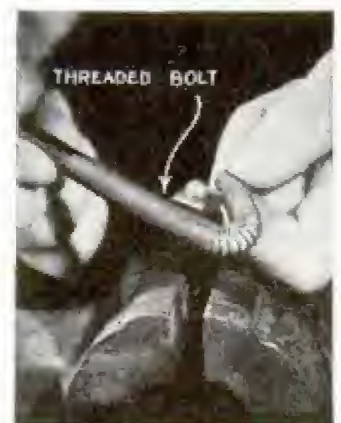
carried in the pocket if desired. The sliding cup inside of the container is fitted with a piece of soft eraser. Pushing up the cup to the top

of the container allows you to select any drill, after which you drop the cup back and apply the cap.

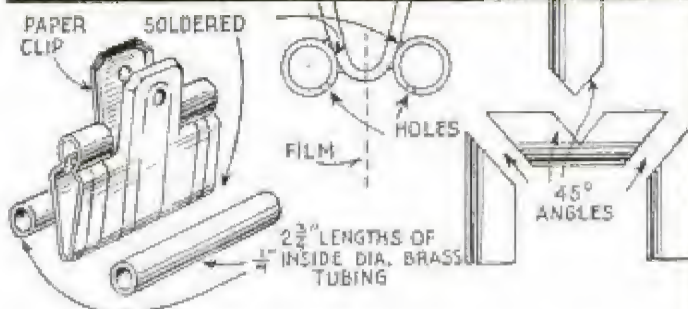
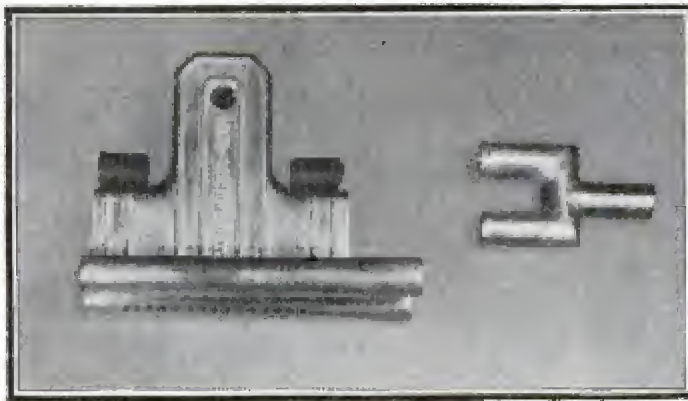
—Arnold Rauschwald, New York, N. Y.

Emergency Wrench from Bolt

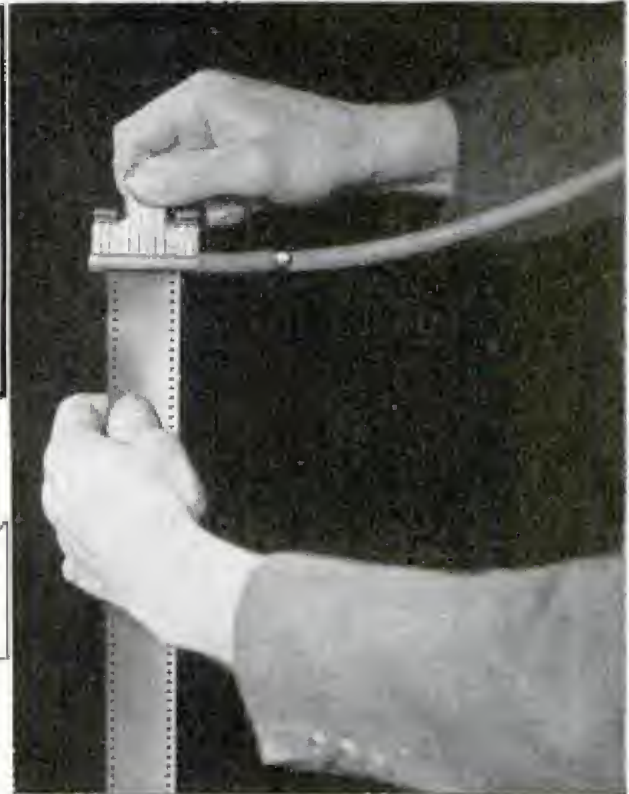
A wrench for small nuts may be made by bending the threaded end of a bolt as shown. If the wrench is to be used any length of time, run the threads well back toward the head and then flatten the end.



Roll Film Is Gripped in Jaws of This Washer



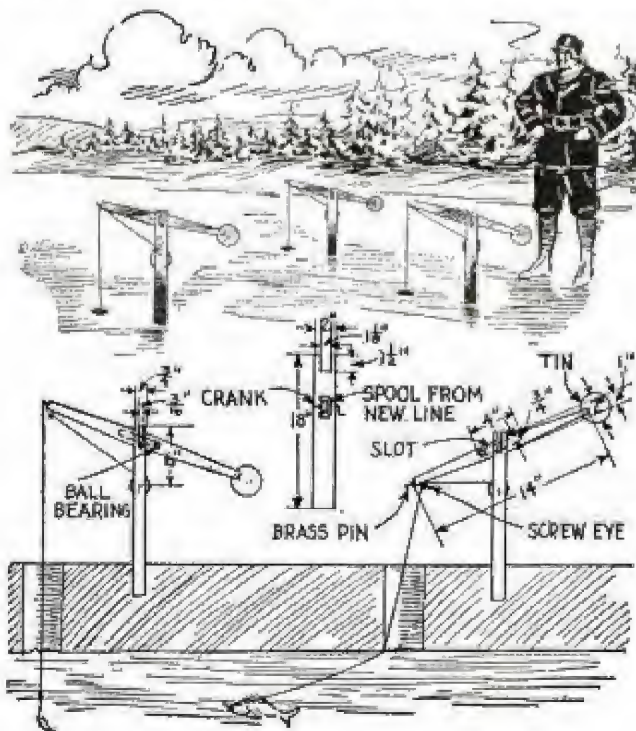
Gripping the film between its spring jaws, this washer is very handy, especially for the smaller sizes of film. Perforated with a row of $\frac{1}{16}$ -in. holes spaced about $\frac{1}{16}$ in. apart, two spray nozzles on the jaws direct a smooth sheet of water down each side of the film. A rubber tube connects to a near-by water faucet by means of an



adapter. In this particular case the spray nozzles were connected to a Y-fitting with short lengths of rubber tubing. Besides being portable, this washer takes very little space when it has to be stored.

Ice-Fishing Semaphore Shifts Balance When Line Is Pulled

Many ice-fishing signals move or wag only when the fish jerks at the line and



then return to their normal position. This one, however, continues to show that there has been a bite, even after the line has again become slack. A 1-in. crossarm having a numbered tin-can lid at one end, is pivoted in a balanced position on a vertical support, which is driven into the ice. A slot is cut in the center of the crossarm to take a steel ball, which should be free to roll in the slot after two pieces of sheet metal are tacked on either side to retain it. A spool to wind up the line is fitted in a cutout in the vertical piece, and the line is threaded through screw eyes as shown. When the fin end of the crossarm is pushed down, the ball rolls toward this end and its weight keeps the crossarm in this position. When a fish tugs at the line, the other end of the arm goes down so that the ball rolls toward the latter end and keeps the crossarm in this position.

—Cedric A. Wells, W. Allis, Wis.

Faster than the Wind

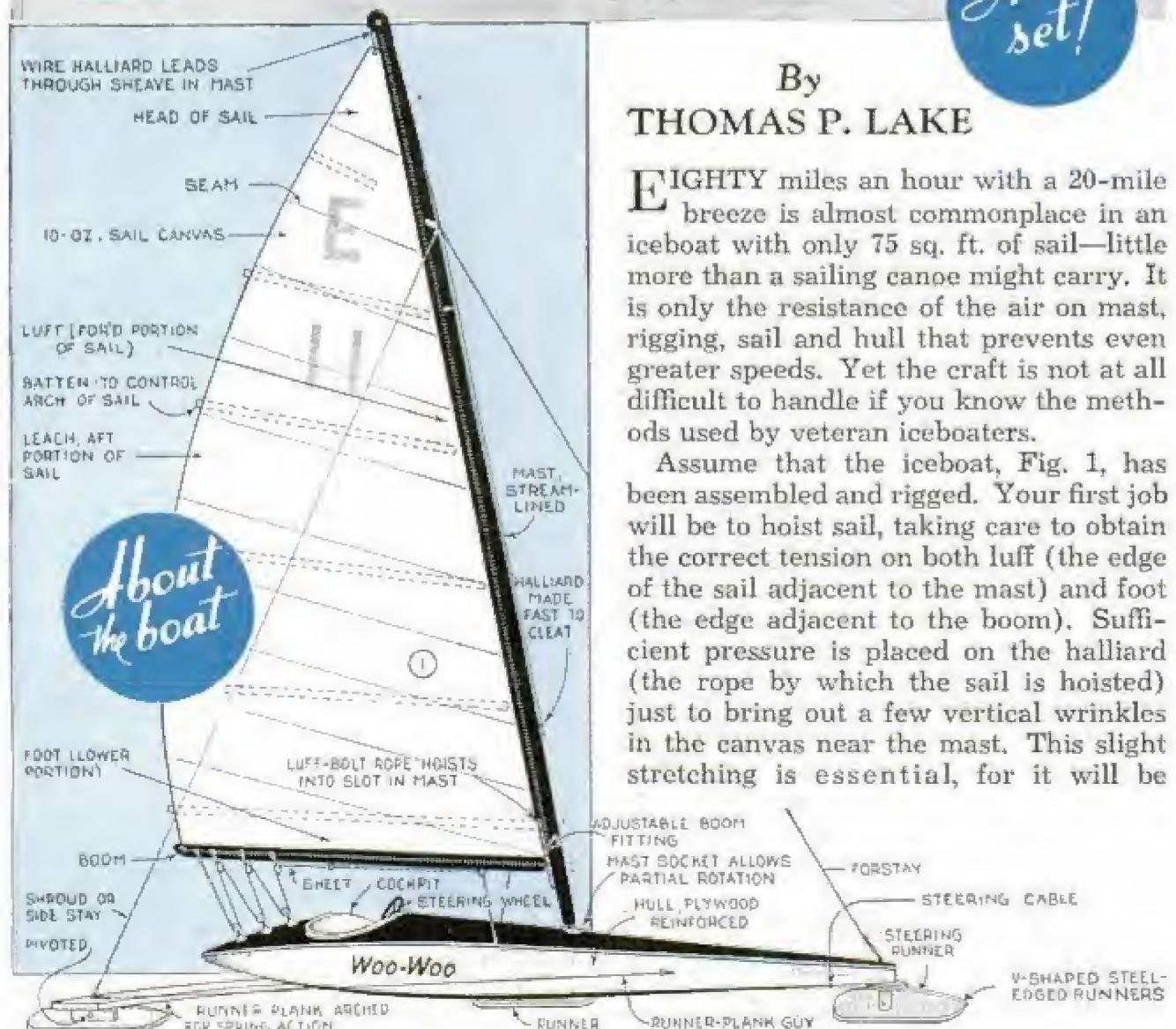


All set!

By
THOMAS P. LAKE

EIGHTY miles an hour with a 20-mile breeze is almost commonplace in an iceboat with only 75 sq. ft. of sail—little more than a sailing canoe might carry. It is only the resistance of the air on mast, rigging, sail and hull that prevents even greater speeds. Yet the craft is not at all difficult to handle if you know the methods used by veteran iceboaters.

Assume that the iceboat, Fig. 1, has been assembled and rigged. Your first job will be to hoist sail, taking care to obtain the correct tension on both luff (the edge of the sail adjacent to the mast) and foot (the edge adjacent to the boom). Sufficient pressure is placed on the halliard (the rope by which the sail is hoisted) just to bring out a few vertical wrinkles in the canvas near the mast. This slight stretching is essential, for it will be

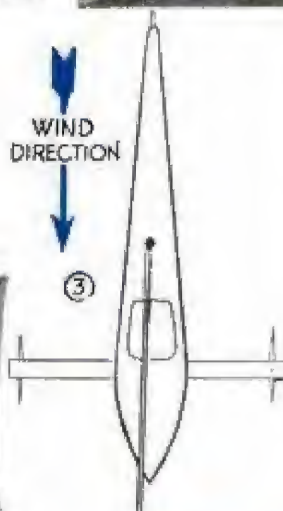


in an ICEBOAT/

Easy-to-follow technique on sailing an iceboat told "in a nutshell" so anyone can become adept — how to hoist sail, take off, tack, gybe, control sail for speed, stop and other maneuvers

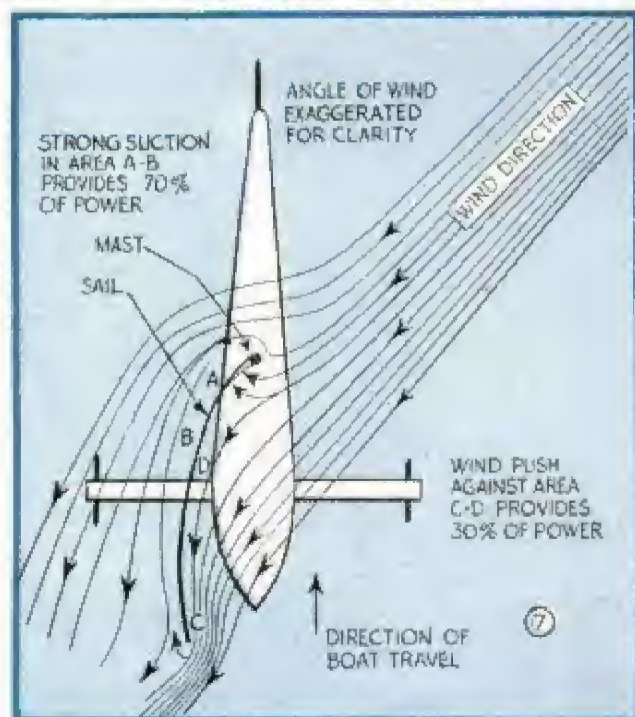
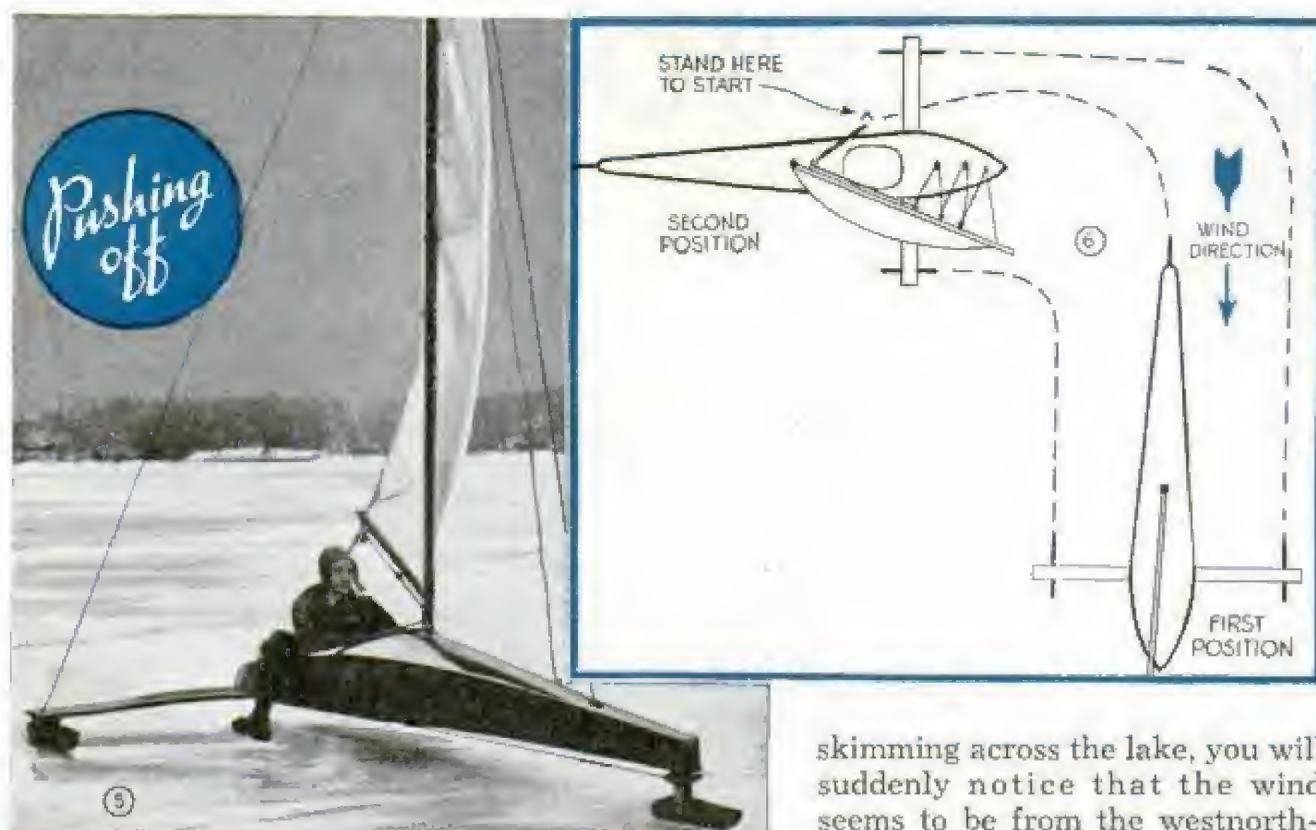
equaled later in the opposite direction by the effect of the wind, and the sail then will be smooth. The foot of the sail should be similarly stretched for the same reason. However, care should be taken to avoid overstretching.

Before you hoist sail make sure that the boat is headed directly into the wind, Figs. 2, 3 and 4, and the sheet (the rope used to control the sail) is slack so that the sail can swing back and forth as the puffs of wind vary in direction. This will prevent the boat from sailing away with no one on board. Having hoisted sail, you are ready to go. Assume that in this case the breeze is from the north and blowing about 10 m.p.h., the



ice is smooth and free from snow, and you are to make the first run to the west, directly across the wind. Take hold of the steering wheel, or lever and push the boat forward, at the same time turning it to head west as in Fig. 6. Holding the sheet in one hand, you now take this in until the sail makes an angle of about 15 degrees with the boat. Then push against the cowl, run a few steps, and, when the boat is moving briskly, jump into the cockpit as in Fig. 5.

The boat immediately picks up speed and is soon moving at about 20 m.p.h. You will discover that it takes very little effort to keep the boat headed in a straight line. The sail makes a smooth curve from the boom to the masthead. If you let a foot of the sheet slide slowly out, the boom moves out correspondingly. The sail makes a deeper curve, and at the same time the speed of the iceboat is reduced noticeably. If you take in the same amount of sheet the boat



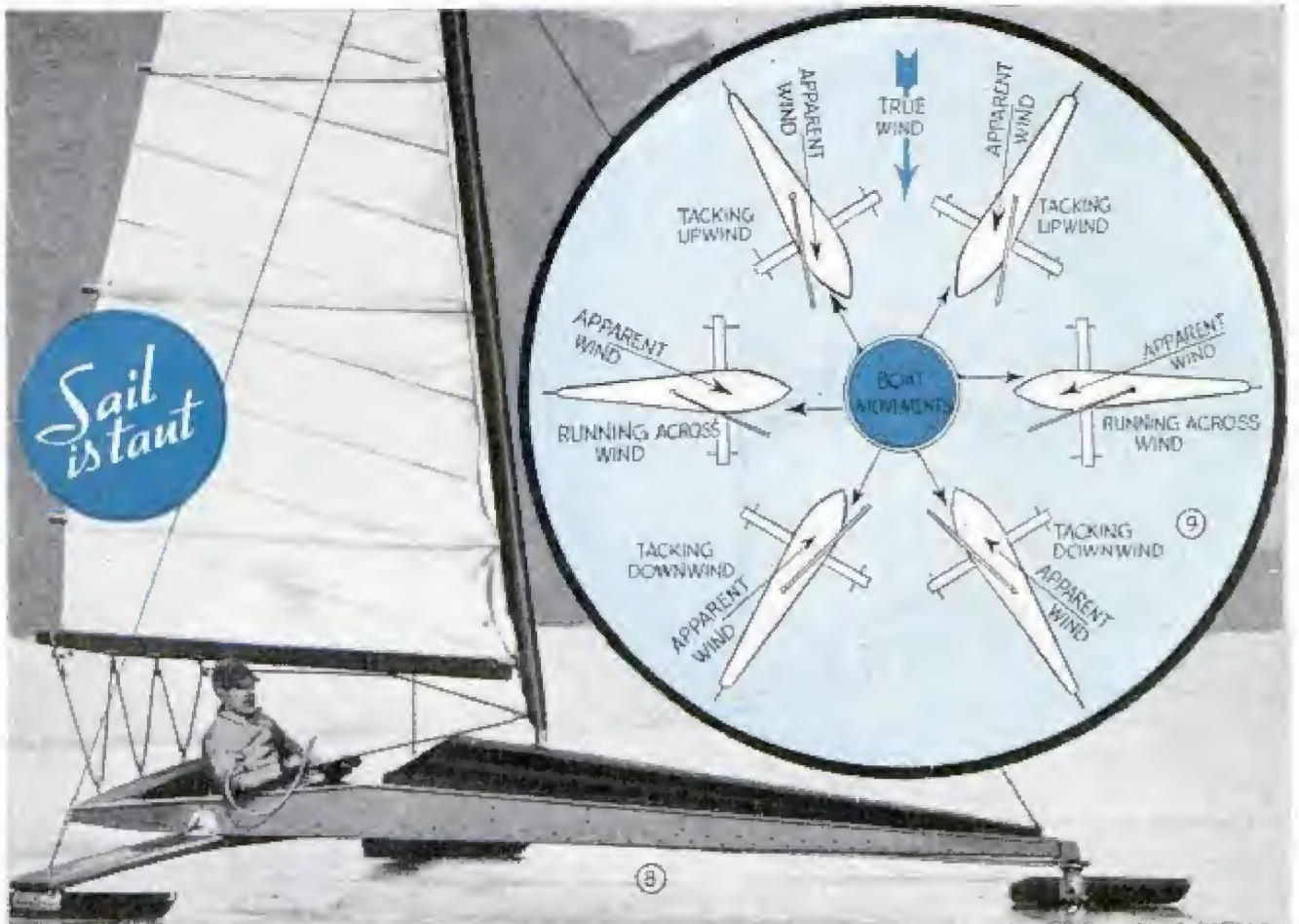
immediately regains its original speed and if the sail is additionally trimmed by taking in several more feet of sheet it becomes noticeably flatter, and the speed will increase to about 30 m.p.h., Fig. 7. From this it would appear that trimming the sail makes the boat go faster, but when you take in the sheet still more the speed immediately decreases, which proves that the sail can be too flat, as well as too slack. The trick is to keep the sail at the point of greatest driving power. While you're

skimming across the lake, you will suddenly notice that the wind seems to be from the westnorthwest, some 65 degrees west of north. This is what sailors term the "apparent" wind as distinguished from the true wind, Fig. 9, and is due wholly to the speed of the craft.

Now, just about the time you settle back to enjoy the thrills, there is a sudden acceleration of speed and the windward runner lifts off the ice as in Fig. 12. A puff of wind has struck the sail, tipping the craft to leeward. While this is disconcerting to the novice, it's an old story to the veteran. He simply lets a few inches of sheet slide through his hand, thus decreasing the power in the sail, and the runner settles back to the ice. Then he re-trims his sail.

By this time you are probably approaching the far side of the lake and you want to make a 180-degree turn and head back toward the starting point. This may be done in either of two ways, Fig. 10: turning into the wind, called tacking, or turning away from the wind, called gybing. We tack by turning the wheel until the boat begins a gradual turn into the wind and by holding the wheel in this position until the turn is completed. When the boat is headed into the wind, the sail shakes violently for a moment, as it is then in the position of a flag in a strong wind.

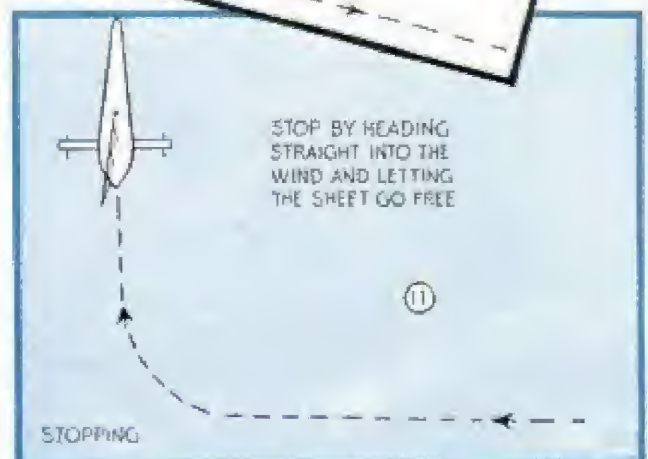
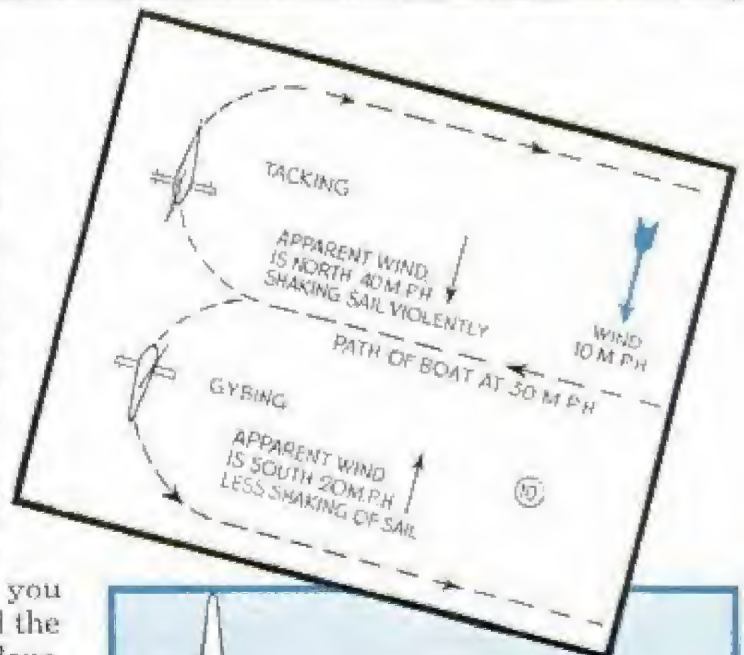
Having made a turn by tacking, you will want to try one by gybing. Turn the boat so as to make a curve downwind and then



hold the steering wheel in this position. When the boat has swung 90 degrees, and is momentarily headed directly downwind, the sail shakes less than when tacking. This is because the speed of the wind is subtracted from the speed of the boat, instead of added to it as when tacking. Continue the turn, and when the wind strikes the sail on the other side, the speed lost during the turn will be regained rapidly.

About this time it will occur to you that sooner or later you will want to stop. Fig. 11 shows what to do. Recalling what happened when tacking you again turn the steering wheel and head the boat into the wind. When the sail flaps, indicating that it is not effective as a driving power, simply straighten the steering wheel and the boat will coast easily to a stop right into the wind.

Now that you can start, stop and sail across the wind, the next problem is how to sail the iceboat to a point that lies directly upwind. The ten-mile breeze is still blowing from the north, and the place to which you want to go is several miles directly north. As before, push off across





the wind, Fig. 13, but this time, instead of sailing due west, let the boat gain speed and then trim the sail flatter by stages to bring the boat closer and closer to the wind. By the time you near the end of the first tack, the boat should be headed nearly due northwest and traveling almost as fast as when going across the wind. Now turn or tack ship as indicated in Fig. 13, and take the wind on the other side of the sail. In this case only two tacks or legs are nec-

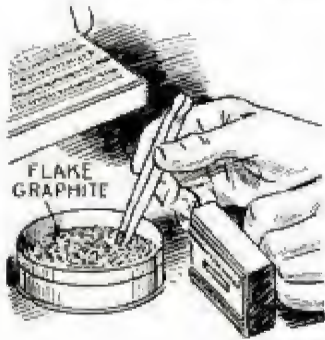
essary to arrive at the destination, but often it is necessary to tack several times in order to reach a given point.

Having arrived at the windward destination, you will want to return down wind, Fig. 14. Start out across the wind to get up speed. A rather common error, that of heading directly downwind, is also shown in Fig. 14. Even though you let out the sheet until the sail is at right angles the boat will drift along at a slow, dragging pace. Obviously this is not the way to get to leeward (in the direction in which the wind is blowing). To correct the error, head the boat across the wind again and trim in the sheet to gather way on the diagonal course. After getting up speed, change the course about 15 degrees toward the south, or a total of 105 degrees from the true wind. Immediately you do this there will be a quick but smooth acceleration in speed for you are now on the point of fastest sailing for iceboats. Covering a mile will be a matter of seconds. To make the best southerly progress, head 30 degrees farther south, or a total of 135 degrees from the true wind. Should an unusually strong puff of wind strike the sail, and the windward runner lift several feet from the ice, you can ease

the boat back to an even keel by changing the course a little more downwind. As you run out of the puff, the speed will again fall off unless you come back on the original course. Having run to a point nearly opposite the downward destination, you gybe, take the wind on the other side of the sail for a stretch, then turn left, right into the wind and coast to a stop. There you have the rudiments of sailing an iceboat. Of course, practice will develop skill in the finer points necessary in competitive sailing and winning races.

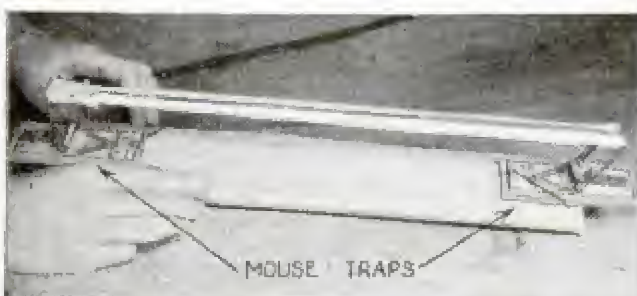
Graphite on Rubber Type to Set It Easily

If your work requires the use of a grooved wooden block in which to set up rubber type, or if you have a rubber stamp on which the date must be changed daily, and you have trouble inserting the type during damp weather, a little flake graphite may solve the problem. Keep a small amount of it handy and when you pick up the type with tweezers, just dip it in the graphite and you will find that it slips into the holder without any trouble.



Stretcher Holds Articles Taut While Drying

Belts for dresses, and various other articles that must be held taut while drying, can be handled to good advantage in this simple stretcher. Two mousetraps are screwed to a base and the articles to be dried are attached to the spring jaws of the traps as indicated in the photo.



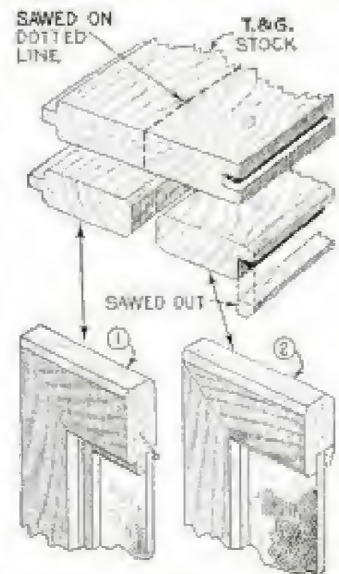
Egg Tester Made from Lamp with Hole in Shade



To test eggs in his produce room, and at the same time have sufficient light for packing, labeling, etc., one merchant employs a desk lamp with a suitable hole cut in the center of the shade. The eggs are passed over the opening in the reflector for rapid candling.

Pictures and Paintings Framed with Tongue-and-Groove Stock

Needing frames for some paintings that I had just finished, I assembled them from tongue-and-groove stock. After ripping the stock through the center, the parts of each frame were mitered and sanded. The piece of stock containing the tongue was used for one frame as in Fig. 1, the tongue serving as a molding against which the painting was placed. On the piece containing the groove, one side of the latter was cut away, after which it was mitered and assembled as shown in Fig. 2, the cut-away portion of the groove being used as a molding to hold the painting in place in the frame.



—A. Jorgensen, Berkeley, Calif.

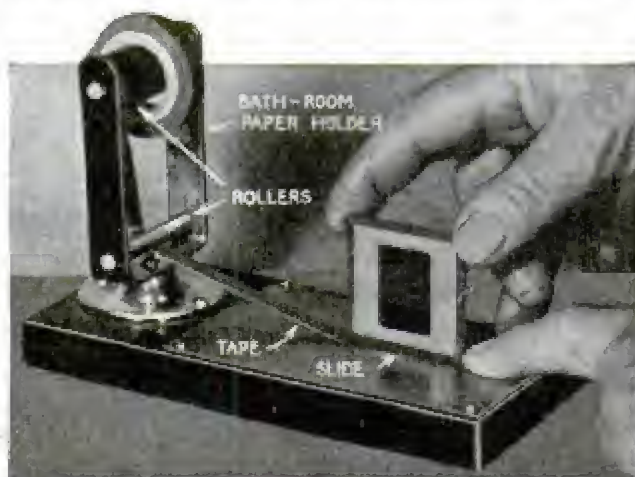
Non-Slip Guide for Glass Cutting Has Rubber-Coated Surface



Keeping a ruler or straightedge in place when cutting glass for picture frames, windowpanes, etc., is a simple matter if the back of the straightedge is given a coating of rubber cement. One coat of cement is sufficient and only occasional applications are necessary as the cement, slightly tacky, remains on the surface under continued usage unless it is rubbed off.

Jig to Tape Lantern Slides

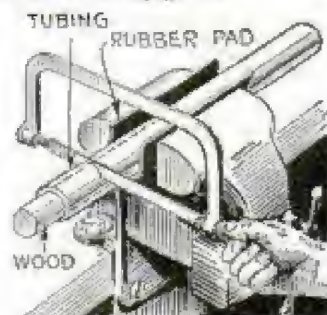
Both amateur and professional photographers who have a number of lantern slides to tape will find this jig a timesaver. Just pull out the tape onto the base of the jig, set the slide on top of the tape and roll it forward until all four sides are covered, pulling the thumb and index finger along the edge of the slide as it is rotated, to press the tape into place. The jig consists of a base on which is mounted a bathroom paper holder carrying two rollers, one at



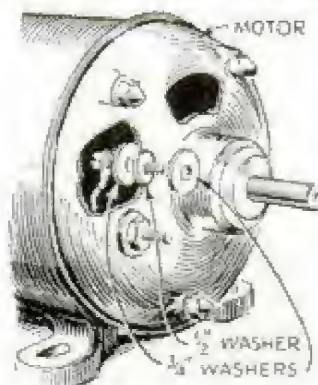
the top to hold the tape roll and a smaller one near the bottom under which the tape is fed. If a paper holder is not handy, one can be made by bending a piece of flat iron to a U-shape and fitting it with a couple of rollers. The working surface of the base is covered with a piece of glass or sheet metal which is screwed, nailed or cemented in place.—Clifford B. Paul, Moline, Ill.

Tubing Sawed Off Neatly When End Is Plugged

The next time you have a piece of tubing to saw off, drive a dowel or a piece of round wood tightly into the end as indicated. This will help prevent the teeth of the saw from catching on the thin edges of the tubing. Also, the wood plug aids in cutting straight across the tube. If the plug is long enough to reach beyond the jaws of the vise in which the tube is held, it will tend to prevent crushing by too much pressure on the vise jaws.



Insulating Terminal Posts on Electric Motor



Faced with the problem of effectively insulating terminal posts installed on an electric motor, the job was done as follows: Two 1/2-in. holes were drilled through the housing to take fiber faucet washers, after the brass machine screws with fiber washers under their heads were passed through them. Similar washers on the outside completed the assembly as indicated. The spacing washers must be somewhat thinner than the wall of the motor housing to permit tightening.

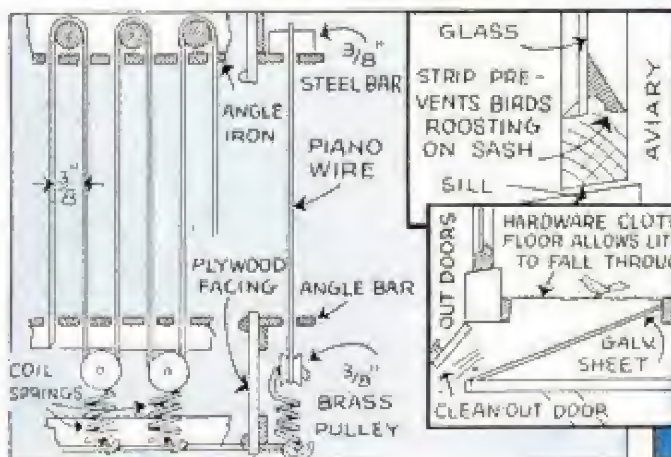
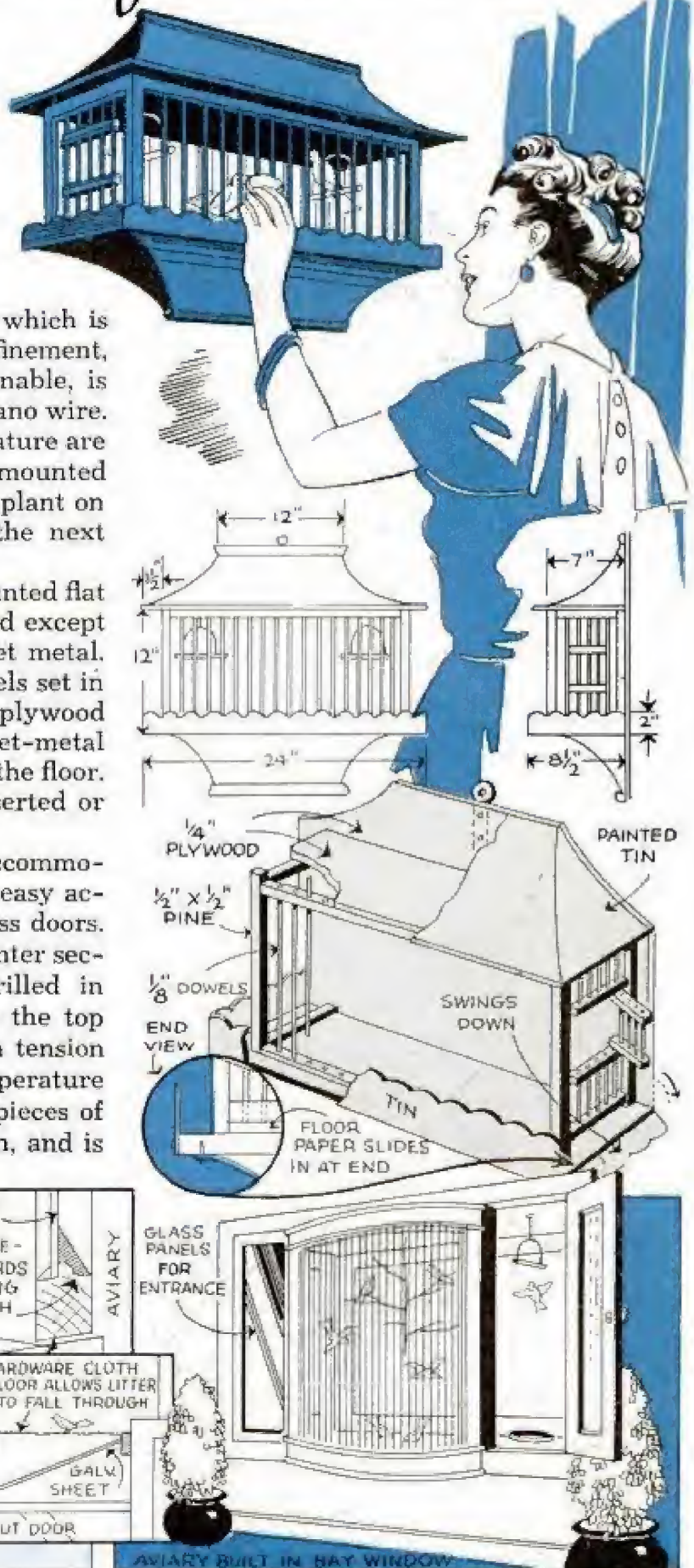
Indelible-pencil stains should be rubbed with denatured alcohol, then after about five minutes, rinsed in a mild soapsuds.

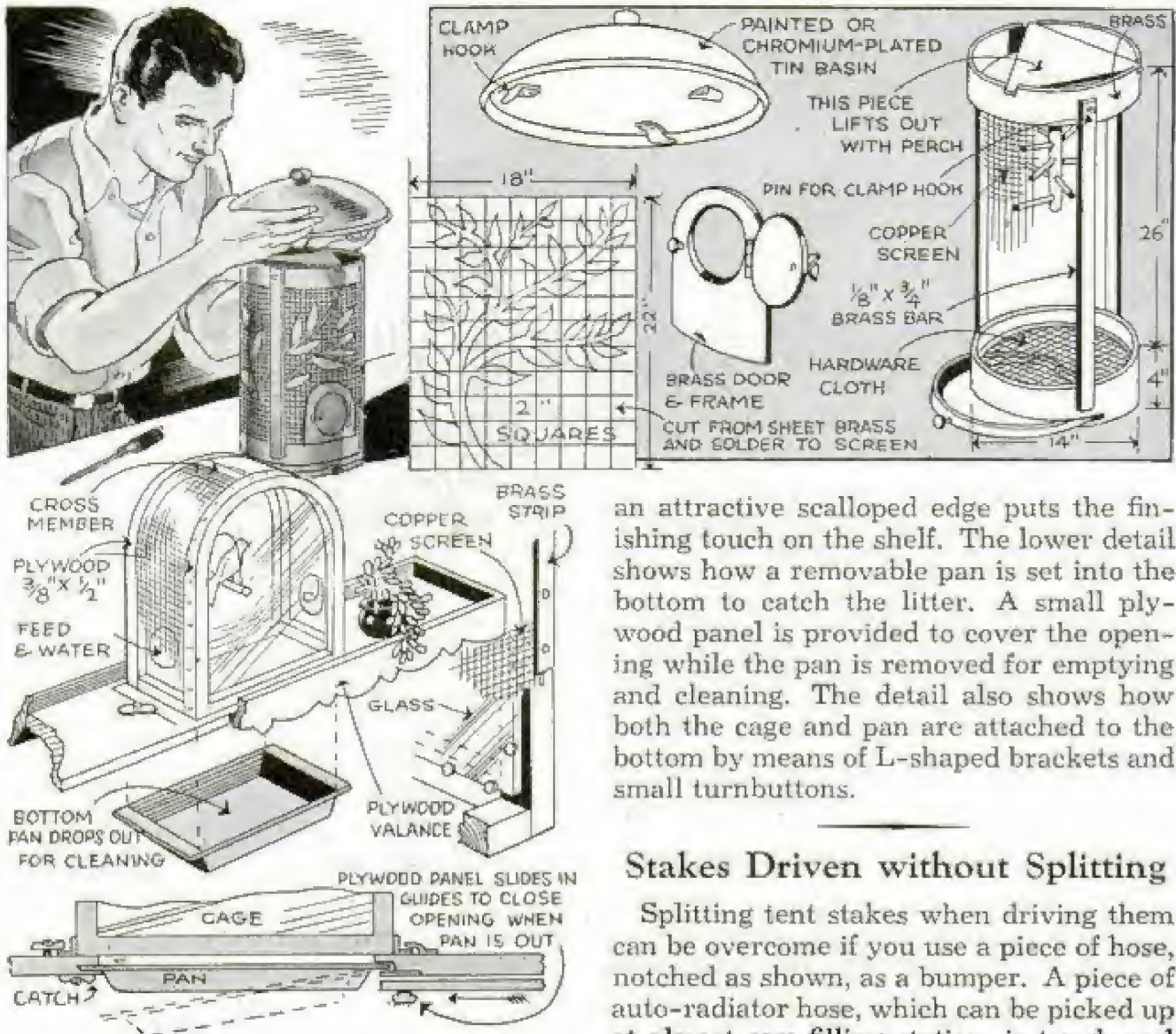
NEW CAGES *for* CANARIES

OF THESE four new designs in canary cages, there may be something to suit your fancy; your choice may be the small one at the right, which has pleasing curves at top and bottom, or it may be a larger one that fits a bay window or can be built on a porch, and really makes quite a display of your pets. In this one which is shown below, the effect of confinement, which is to some extent objectionable, is greatly minimized by using fine piano wire. Other cages of an especial novel nature are the cylindrical type, and the one mounted on a shelf with space for a potted plant on each side. Both are shown on the next page.

The first cage, as you see, is mounted flat against a wall and is made of wood except the top and bottom, which is sheet metal. The front and ends consist of dowels set in a frame which is attached to a plywood back and floor. A scalloped sheet-metal skirt is tacked around the edge of the floor. A paper floor covering can be inserted or removed from one end.

The cage below is large and accommodates a number of birds. There's easy access to the inside through two glass doors. The piano wire over the curved center section is strung through holes drilled in lengths of angle iron or brass at the top and bottom. To maintain uniform tension on the wire regardless of temperature changes, it is brought over short pieces of iron rod laid on the top angle iron, and is

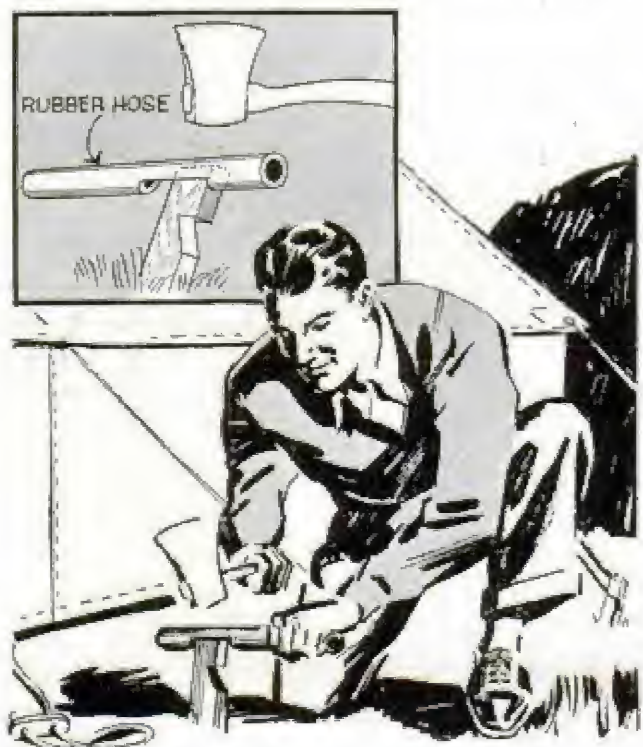




an attractive scalloped edge puts the finishing touch on the shelf. The lower detail shows how a removable pan is set into the bottom to catch the litter. A small plywood panel is provided to cover the opening while the pan is removed for emptying and cleaning. The detail also shows how both the cage and pan are attached to the bottom by means of L-shaped brackets and small turnbuttons.

Stakes Driven without Splitting

Splitting tent stakes when driving them can be overcome if you use a piece of hose, notched as shown, as a bumper. A piece of auto-radiator hose, which can be picked up at almost any filling station, is tough and will withstand considerable hammering.

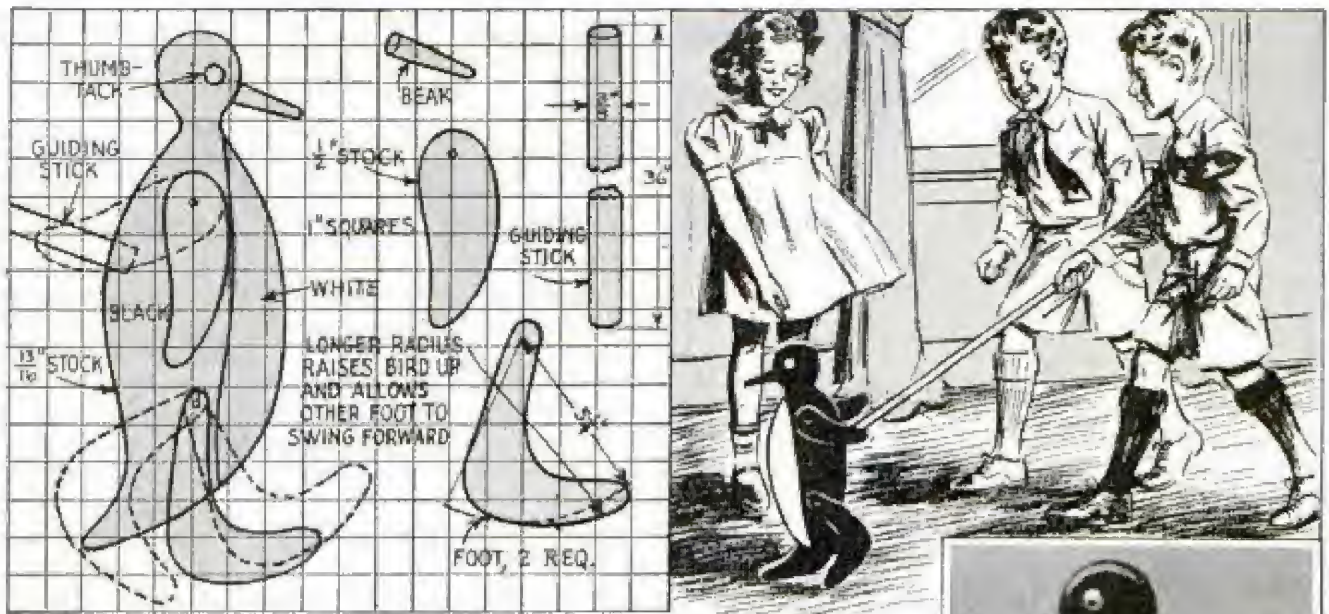


threaded through small pulleys attached to short springs at the bottom. A hardware-cloth floor permits litter to drop through onto a sloping galvanized sheet from which it can be removed.

Finished in burnished brass and copper, and with some chromium-plating, the cylindrical cage is a striking piece of work. The frame is made entirely of metal over which copper screen wire is stretched. A removable metal dome sets off the top in a pleasing manner. The bottom of the cage is covered with hardware cloth, under which is a sliding tray so that litter can be removed without unduly disturbing the birds. The tray slides in a slot cut halfway through the circular frame member of the bottom.

The fourth cage is mounted in the center of a shelf providing space on either side for plants. The cage has a glass front, and screen-wire sides which converge into a rounded top. A plywood valance having

Wood Penguin Waddles in Lifelike Manner

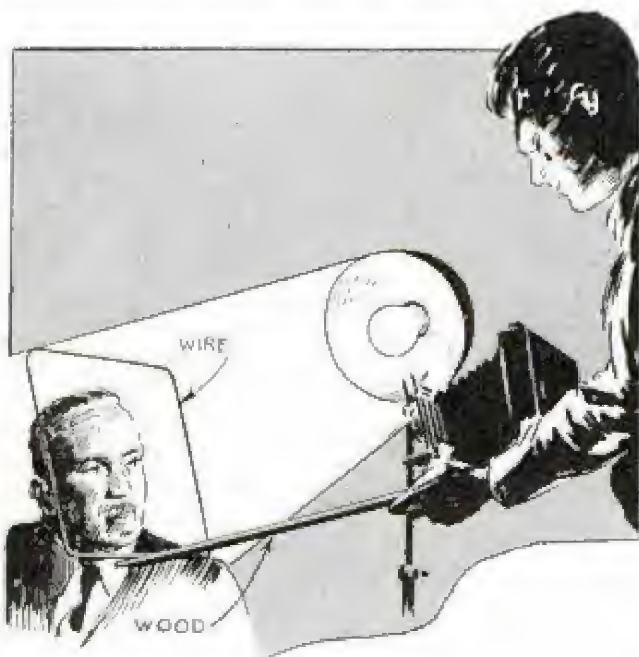


Although he's remarkably realistic in color, size and also in his manner of getting about, this penguin is made of wood and is pushed with a stick. Body and head are shaped from one piece of $1\frac{1}{16}$ -in. plywood while the wings and legs, or feet, are separate parts cut from $\frac{1}{2}$ -in. material and pivoted to the body. The curve of the feet is the important thing as it is this curve which allows the penguin to walk in a lifelike manner. Of course, the feet must be pivoted so that they swing freely. This is done by drilling an oversize hole in each leg for a round-headed screw. A thin washer is placed over the screw between the leg and the body and also under the screw head. The wings can be pivoted in the same way.

—Dick Hutchinson, Ithaca, N. Y.



Extension Wire Finder Assures Sharp Focus for Close-Ups



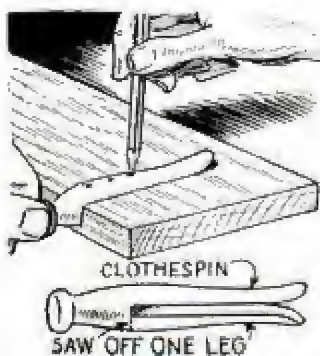
Here's a quick way to focus sharp when taking close-ups with a folding camera which is not fitted with a ground glass. The camera must be mounted on a tripod and the latter provided with a screw long enough to pass through a strip of $\frac{1}{4}$ -in. pine and turn into the threaded camera socket. Then a wire finder, the dimensions of which are proportional to the size of the film, is mounted on a $\frac{1}{4}$ by 2 by 36-in. length of pine. Camera and finder are now mounted on the tripod, and a strip of waxed paper is stretched over the opening at the back of the camera. After bringing the wire finder into sharp focus the tripod screw is tightened. In use, the frame is placed about the subject, the points at which the sharpest focus is desired being in exactly the same plane as the wire frame.

Safelight to Inspect Photo Prints in Your Darkroom



Suspended above the hypo tray, this safelight will enable you to inspect immersed prints without removing them from the trays and carrying them outside if it is not desired to turn on other lights in the darkroom. Two telescoping cardboard tubes comprise the shade, which has a wood ring screwed or bradded into one end of the smaller tube. The ring fits over a two-piece porcelain receptacle, and a thin fiber or Bakelite ring, screwed to the wood one, fits between the parts of the receptacle. A feed-through switch is fitted just above the lamp.

Marking Gauge Improvised from Clothespin



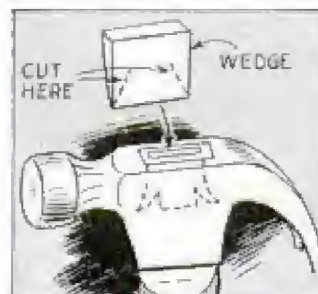
When a marking gauge was needed and none was at hand, I improvised one from a common clothespin. One leg was cut off to form a shoulder to ride against the edge of

the work, and holes were drilled at predetermined distances to take the point of a lead pencil.

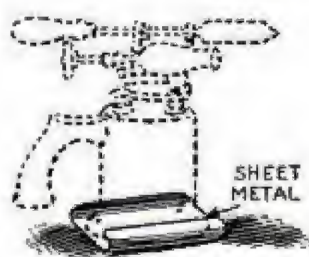
—Wayne C. Leckey, Aurora, Ill.

Split Wedge on Hammer Handle Holds Securely

Before driving a steel wedge into the end of a hammer handle cut it with a hack saw as indicated. Then the edges will flare out when the wedge is forced into the wood so that there will be little chance of it working out of the handle.



Blowtorch Set on Flanged Plate Cannot Tip



edges to the bench top. Pushing the blowtorch base under the flanges will serve to anchor it securely and avoid mishaps.

When placing heavy soldering irons on a blowtorch, and it has a tendency to tip, just tack a small plate of sheet metal with flanged

Legs of Dividers Protected by Pencil Ferrules

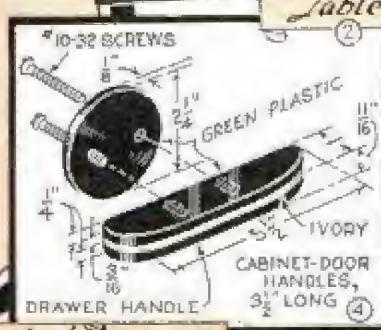
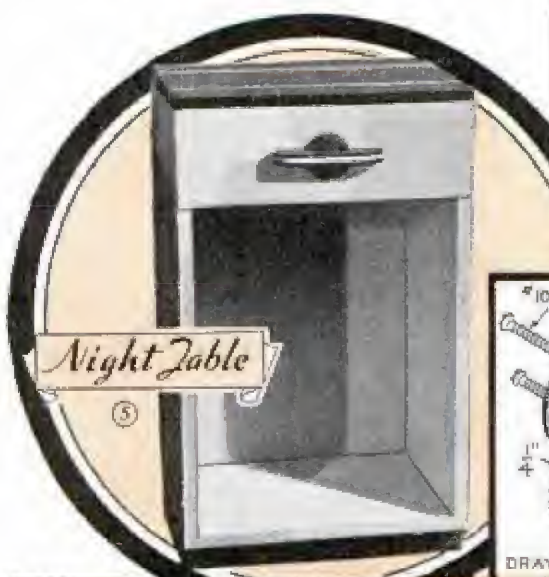
Ferrules removed from old lead pencils, after the rubber eraser has been worn down to the metal, provide handy protectors for the ends of dividers and compasses. The pointed ends of the legs are pushed into the rubber as shown.



This modern VANITY gives four combinations

By WALTER T. WARDE

THE charm of this combination vanity lies not only in its smart modern lines, but also in the fact that at a moment's notice it can be changed to four different pieces of furniture as you see in Figs. 1, 2, 5 and 6. By loosening the clasps on the back, the vanity can be altered to a chest of drawers and a low table or to a pair of bedside cabinets and a table. To the woman who likes to change the appearance of the room occasionally, such an advantage will make a definite appeal. Colored plastics are used for the tops of tables and cabinets and for the handles. Polished



aluminum bar makes an attractive overlay trim. The color scheme is ivory and jade green. Plastics used on the tops are green with an inlay of ivory. The same combination forms the handles, the colors being laminated together as in Fig. 4.

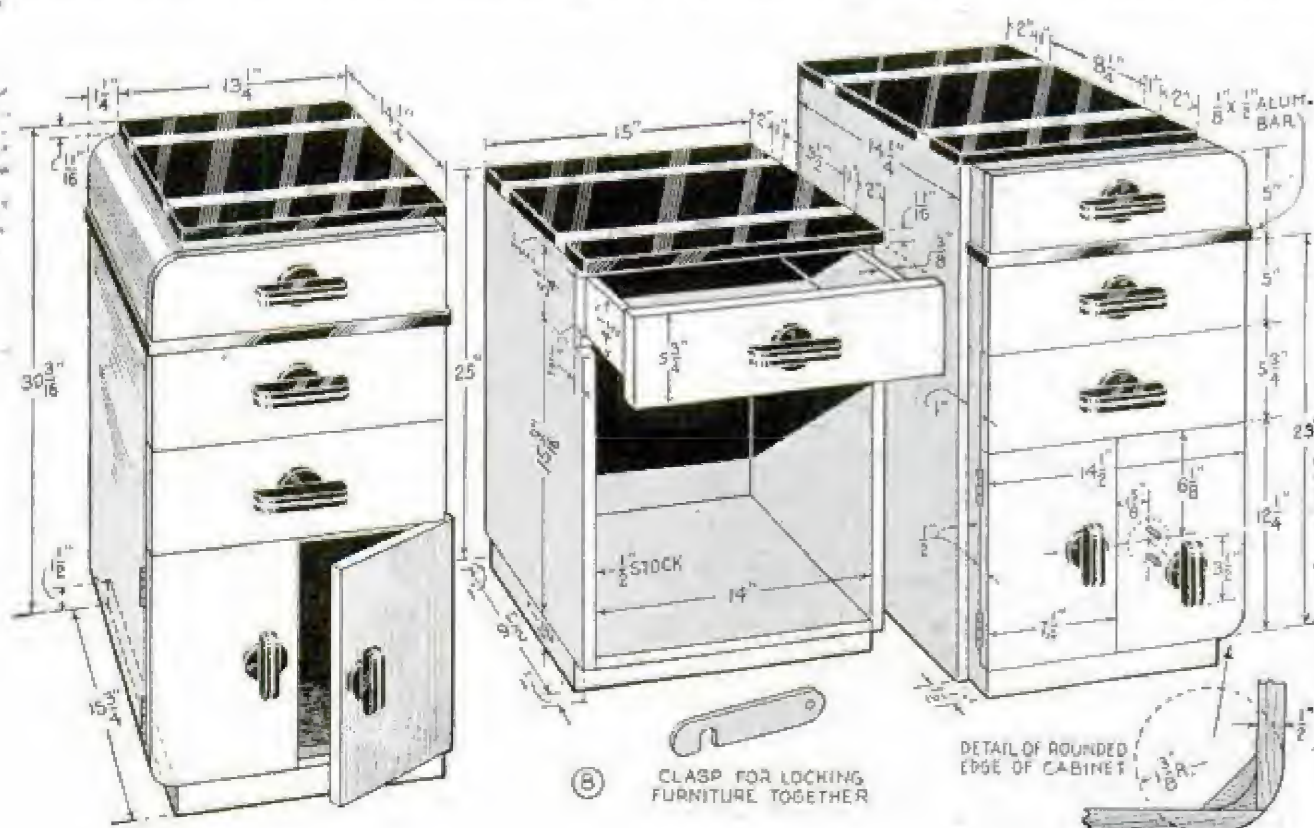
The cabinets are made first of $\frac{1}{2}$ -in. pine or birch plywood, glued and screwed together. As you will see from Figs. 7, 8 and 10 these are of very simple construction. All parts of the cabinets are first cut to dimensions, Fig. 8, and the sides grooved to ac-



commodate the drawer runners, Fig. 9. Center guides also must be installed as in Fig. 10. Finally the top and bottom corners are rounded and then sanded smooth as in the lower-right detail, Fig. 8. Any imperfections in the wood and all nail holes are

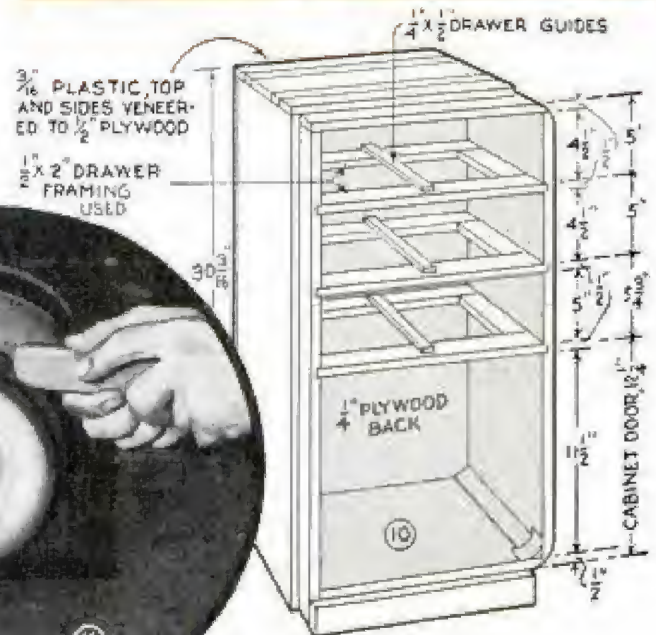
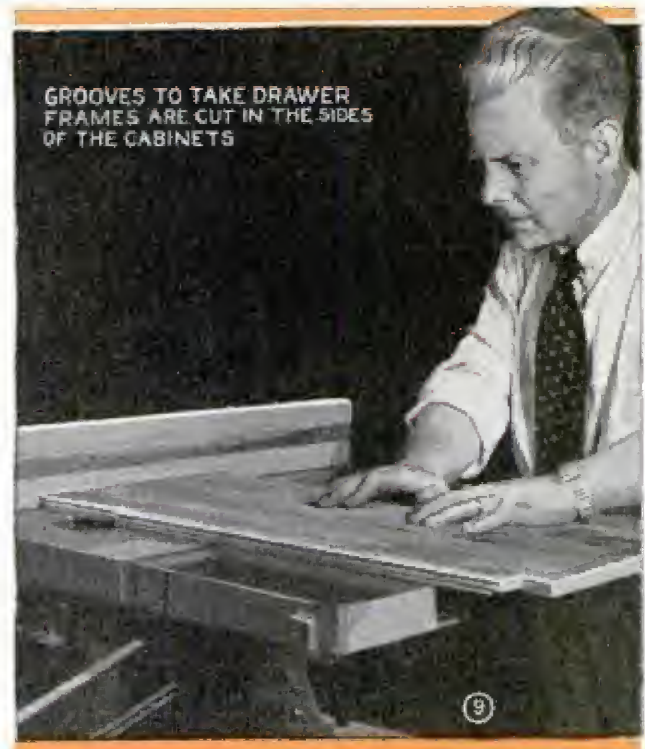
filled with plastic wood and again sanded smooth. The next job is the base which is also of $\frac{1}{2}$ -in. plywood. It is glued and screwed to the cabinet. Furniture glides or sliding casters are attached to the base. Additional wood fillets are then glued back of the rounded corners to strengthen the joint, Fig. 8. This done, you nail on the $\frac{1}{4}$ -in. plywood back, which is not rabbeted in but cut roughly to shape, nailed in position, and the edges filed flush.

Before starting the duplicate work on the drawers, it's a good idea to build up the center table. Although this is really little more than a box, it should be assembled carefully. Note that the edges of the sides are cut away to allow the drawer front to fit flush when closed. The table is backed with $\frac{1}{4}$ -in. plywood nailed in place. This done, you are ready for the cabinet doors and drawers. Doors are of $\frac{1}{2}$ -in. plywood hinged to the sides. The rounded corner of each outside door is filed and sanded to a perfect fit after the door has been hinged in place. Small bullet catches hold the doors closed. The drawers are constructed with $\frac{3}{8}$ -in. sides, $\frac{1}{4}$ -in. plywood bottoms and $\frac{1}{2}$ -in. fronts fastened to $\frac{3}{8}$ -in. inside fronts. The fronts and backs are rabbeted to take the sides and the bottoms are set in grooves. Next fit the drawer guides in position and with the drawers tightly



closed, file and sand the fronts flush with the cabinet. The drawers and the inside of the cabinets are stained as in Fig. 7. The exterior is now gone over with fine sandpaper, then given one application of undercoater and when thoroughly dry, two coats of high-grade ivory enamel, sanding carefully between each coat. The clasps which lock the pieces together are cut and filed from $\frac{1}{2}$ by $\frac{1}{8}$ -in. aluminum bar, Fig. 8. These are screwed to the backs of each cabinet and hook over screws turned into the back of the table.

Finally come the drawer pulls and door handles. These are made of plastic in three pieces, two of $\frac{1}{4}$ -in. thick green and one of $\frac{1}{8}$ -in. thick ivory, laminated. The sheets are first cemented together with special plastic-to-plastic cement, Fig. 12, and afterward cut and filed to shape and polished, Fig. 11. The circular disks are cut from $\frac{1}{8}$ -in. green plastic and cemented to the handle. Handles are then fastened to the drawer fronts with machine screws as in Fig. 4. The $\frac{3}{16}$ -in. plastic for the tops is cut oversize and cemented to $\frac{1}{2}$ -in. plywood with casein glue. When the glue has hardened, the edges are filed flush and slightly rounded, Fig. 3, the whole piece



then being highly polished on the buffing wheel with special plastic polishing compound. Then the tops are glued in position and screwed tight from the underside. The last step is the gluing on of the aluminum bar trim. This is first roughed on the gluing side and the outer face and edges are polished on the buffer. After coating with casein glue the strips are laid in position and held tightly with strips of cellulose tape till the glue is dry. Where the corners overlap, they are filed down flush and given a final polish, using a buffing wheel on the flexible shaft.

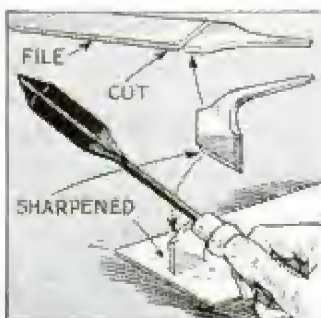
Cutoff Saw Hung from Ceiling Pivots for Various Cuts



Here's a simple cutoff saw that anyone can assemble. The novelty of this setup is that the front axle of an old car is used. This is suspended from the ceiling or basement joists. The saw mandrel is attached to the lower end of the axle and the motor is mounted on a shelf supported by a flat-iron bracket near the upper end of the assembly. Loosening the axle nut at the ceiling permits the saw to be turned for making a cut at almost any angle across the work without moving the latter.

—W. A. Pierce, Fort Ann, N. Y.

Metal Scraper on Soldering Iron



Bent from the tang end of a file as indicated and attached to a soldering iron by slipping the tang into the ferrule of the iron handle, a metal scraper is

always at hand for cleaning surfaces before soldering them. The end of the scraper should be ground to a chisel edge to provide a good scraping surface.

Keeping Hair Off Rabbit Flesh When Dressing It

You can skin a rabbit without getting much of the hair on the carcass by dipping the animal in cold water before dressing it. The water causes the hair to mat and cling together so that, with ordinary precaution, the carcass will be clean. If several rabbits are to be dressed, change water frequently.



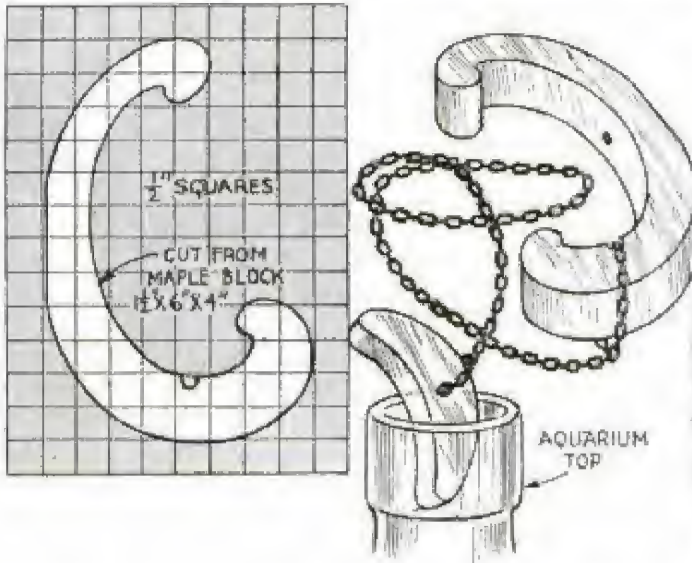
Photo Prints Between Cardboard Will Not Curl

When you have a number of photographs to file or store away, and you don't want them to curl, as they usually do when placed loosely in drawers, put them in a folder made from two pieces of corrugated cardboard. Strips of adhesive or gummed-paper tape serve as hinges, while a couple strips at the front edge and one at each end will hold the two pieces of cardboard firmly against the prints.

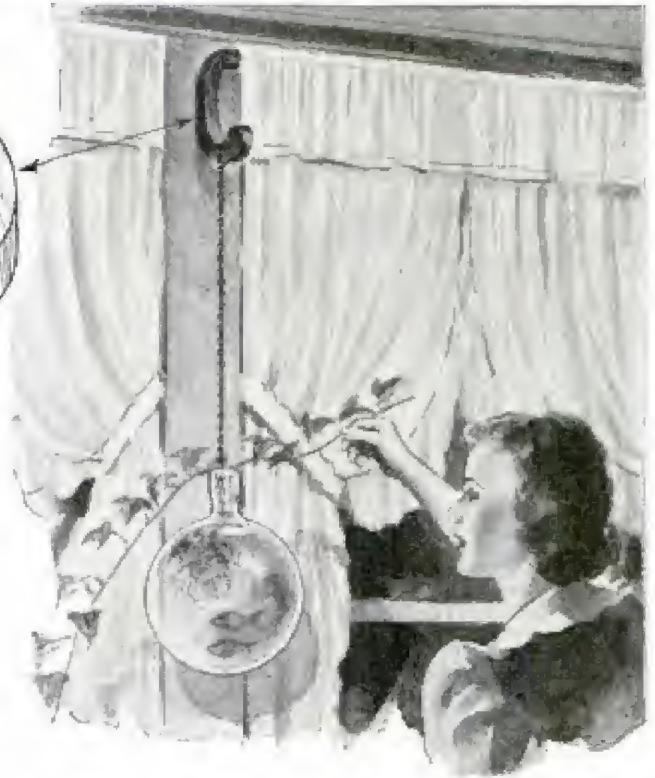
—John G. Roberts, Chicago, Ill.



Hanging Aquarium Adds Novelty to Room



This aquarium is simply a round glass bowl or bottle with a short neck of the type used on some coffee makers. It is suspended from a scrolled hardwood bracket by means of a brass chain, the lower end of which is attached to a crescent-shaped piece of hardwood of such size that it can be slipped through the neck of the bottle. This piece can also be cut from soft metal such as $\frac{1}{8}$ -in. aluminum. Although the bracket may be shaped from solid stock



it will be less likely to split if it is cut from two pieces of thin stock glued together with the grain running at an angle. The suspension chain should be rustproof.

—Dale R. Van Horn, Lincoln, Nebr.

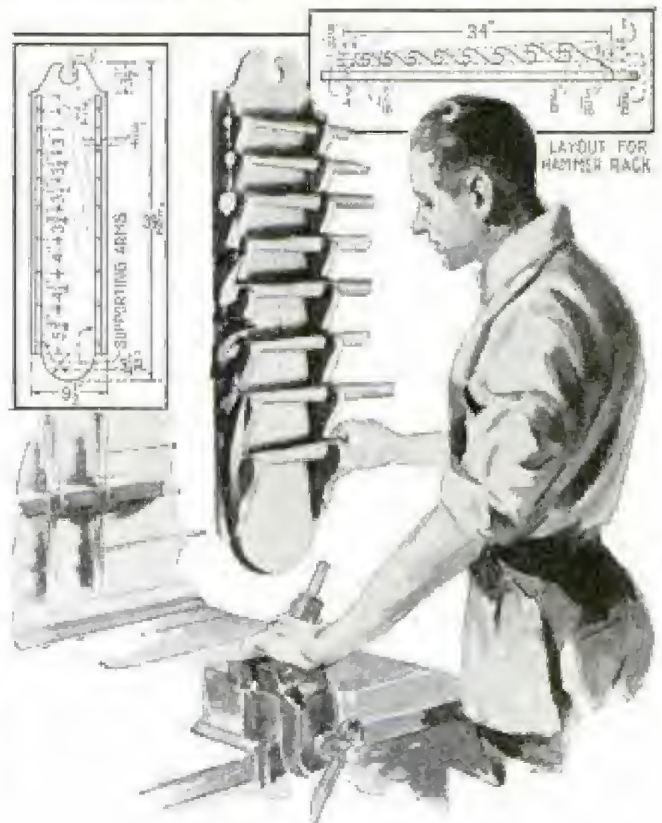
This Wall Rack Holds Your Hammers for Quick Selection

Fastened to the wall above or near your workbench, this rack keeps your hammers within easy reach. The backboard may be scroll-sawed at the top and bottom for appearance, after which two side pieces notched to take the hammer handles are screwed on. Spacing of the notches should be planned carefully so that the heads of the hammers will not interfere with each other and so that they can be arranged in order according to types and size.

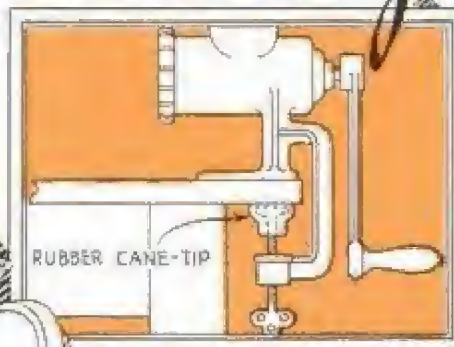
—C. W. Woodson, East Aurora, N. Y.

Wax Protects Wood Carving

Wood carvers who find that their work often cracks due to exposing the unseasoned center portion of the wood to the air, as the work progresses, can avoid this trouble by keeping the exposed surfaces coated with wax, a waxed cloth being kept handy to rub on the work each time it is laid away.



Solving HOME



RUBBER CANE-TIP

DECORATIVE CANDLE
PAINTED WITH SEALING WAX

Left, if you find it difficult to fasten your food chopper firmly to the table, just slip a rubber cane tip over the locking screw. Right, decorative candles will not bend from the heat if you brush them with a light coat of melted sealing wax

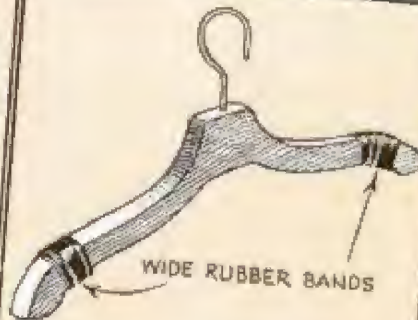


BOTTLE CAP

COINS

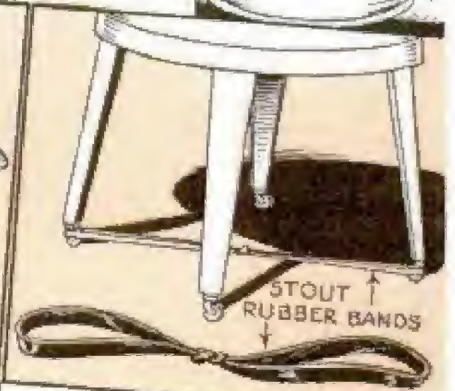
RUBBER BAND

Instead of exposing coins in a bottle, snap a rubber band over the cap and slip them under it



WIDE RUBBER BANDS

Rubber bands near the ends of a wood coat hanger will prevent garments sliding off on the floor



STOUT RUBBER BANDS

A band cut from inner tube and stretched over two casters prevents the washer from "creeping"

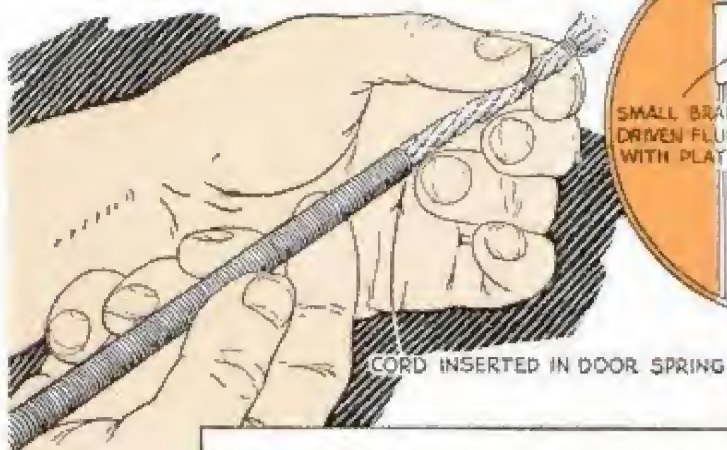


OFFICE
FILE BASKET

MADE FROM
WIRE COAT HANGERS

Left, to minimize dishwashing use paper cups to mold gelatin for desserts and salads. Dip in hot water to remove. In circle, the top of a discarded straw-hat crown makes a good hot-dish mat. The straw can be painted or dyed. Right, a file basket fitted with hooks made from wire hangers is just right for washing lettuce or vegetables

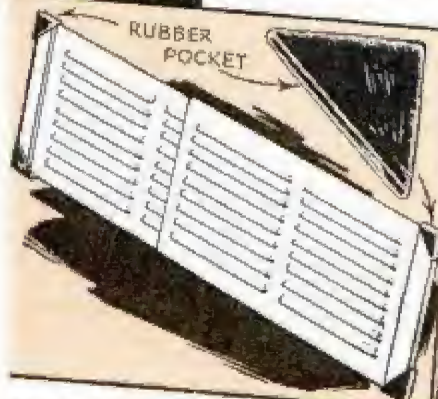
PROBLEMS



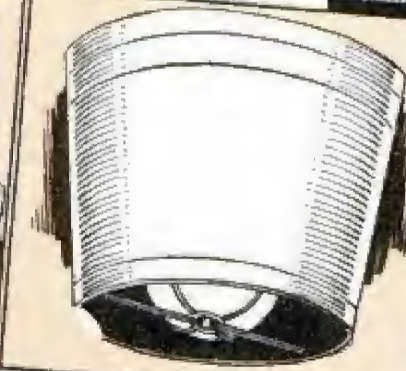
CORD INSERTED IN DOOR SPRING

SMALL BRADS
DRIVEN FLUSH
WITH PLATE

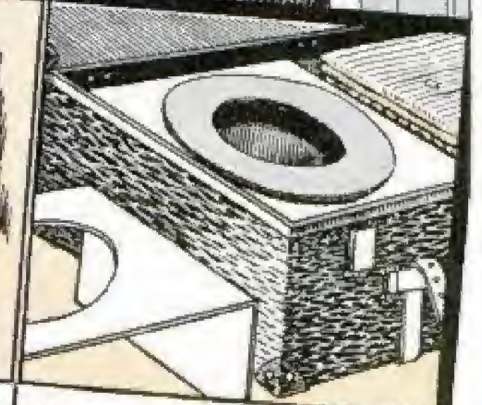
Above, a creaking storm or screen-door spring can be silenced effectively by pulling a length of light rope through it. The rope can be pulled through the spring with a short length of wire and should be a fairly tight fit. Right, the rattling of a door can be stopped by driving small brads into the wood through the latch opening of the striker plate as shown in the circle



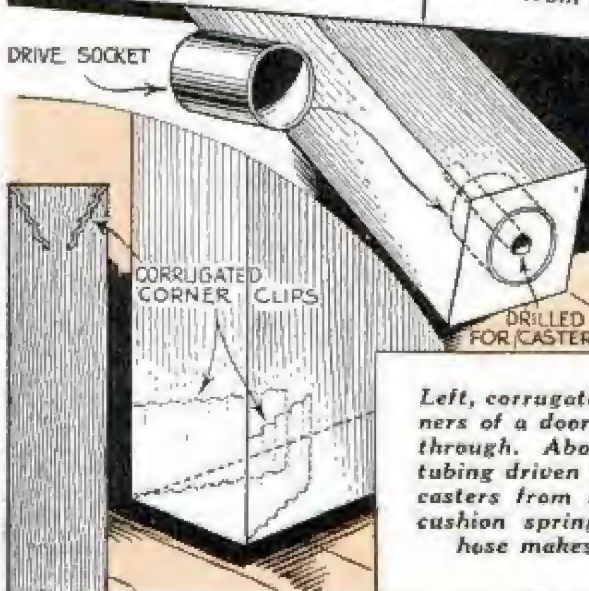
Rubber corner pads cemented on a metal window ventilator will prevent marring of the sill



A snap-on lamp shade turned upside down will eliminate glare from ceiling lights



A piece of cardboard cut and bent as shown holds a hat in suitcase without crushing

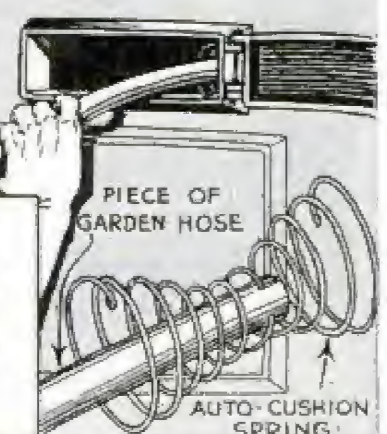


DRIVE SOCKET

CORRUGATED
CORNER CLIPS

DRILLED
FOR CASTER

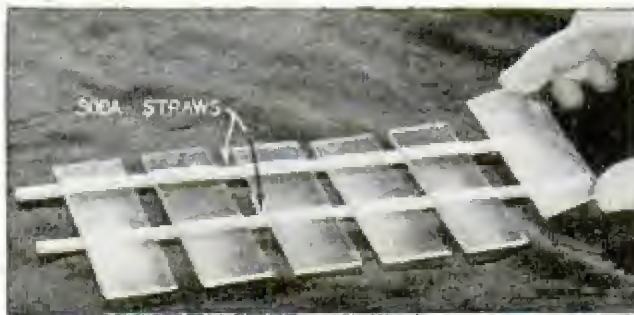
Left, corrugated nails driven into the corners of a door will prevent mice gnawing through. Above, a short length of thin tubing driven into furniture legs prevents casters from splitting them. Right, a cushion spring attached to a length of hose makes a good furnace cleaner



PIECE OF
GARDEN HOSE

AUTO-CUSHION
SPRING

Microscope Slides Supported by Soda Straws

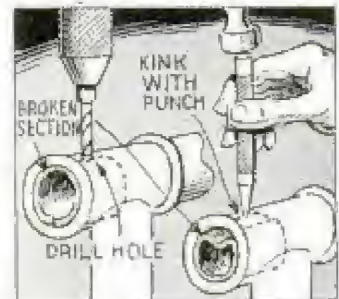


When using a microscope, place a couple of soda straws on a bench near by so that you can lay the slides on top of them as shown in the photograph. This not only protects the specimens on the slides against damage when laid down, but also enables you to pick the slides up easily.

☛ A soda straw slipped over the spout of an oilcan provides a good extension.

Removing Broken Pipe Ends from Fittings

The next time the threaded end of a piece of pipe breaks off inside a tee, elbow or other fitting, try the following method of removing it: Drill a tiny hole close to the outer end of the fitting so that it just breaks through to the pipe. Then bend down the broken piece of pipe by driving a small punch through the hole in the fitting. After this has been done, you can usually turn out the broken piece easily. When the fitting is used again, there is little possibility of it leaking because there are several threads between the hole and the end of the pipe inside the fitting.



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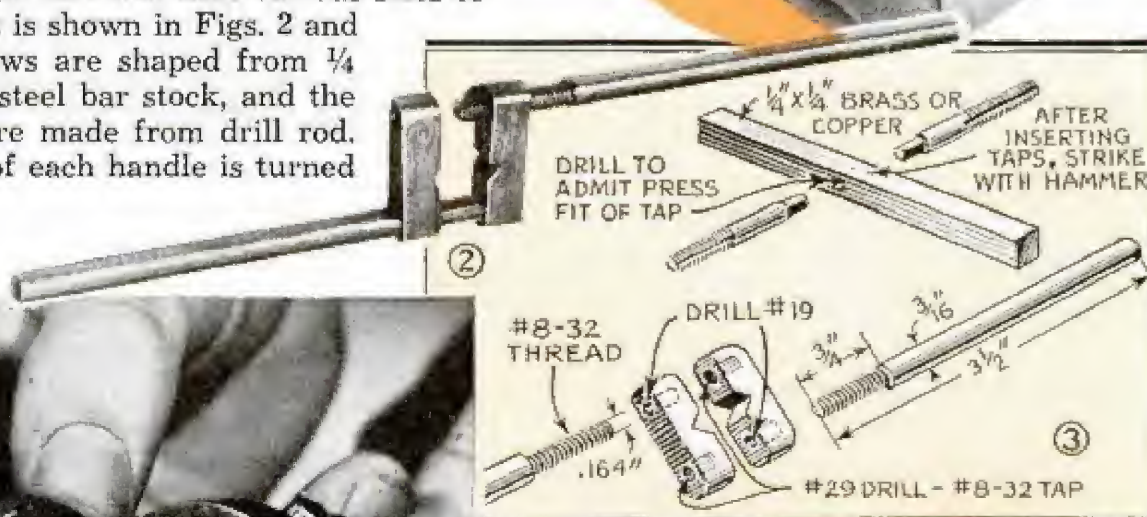
POPULAR MECHANICS PLAN SERVICE, 200 E. Ontario St., Chicago, Illinois



Tap and Die **HOLDERS** *speed up hand work*

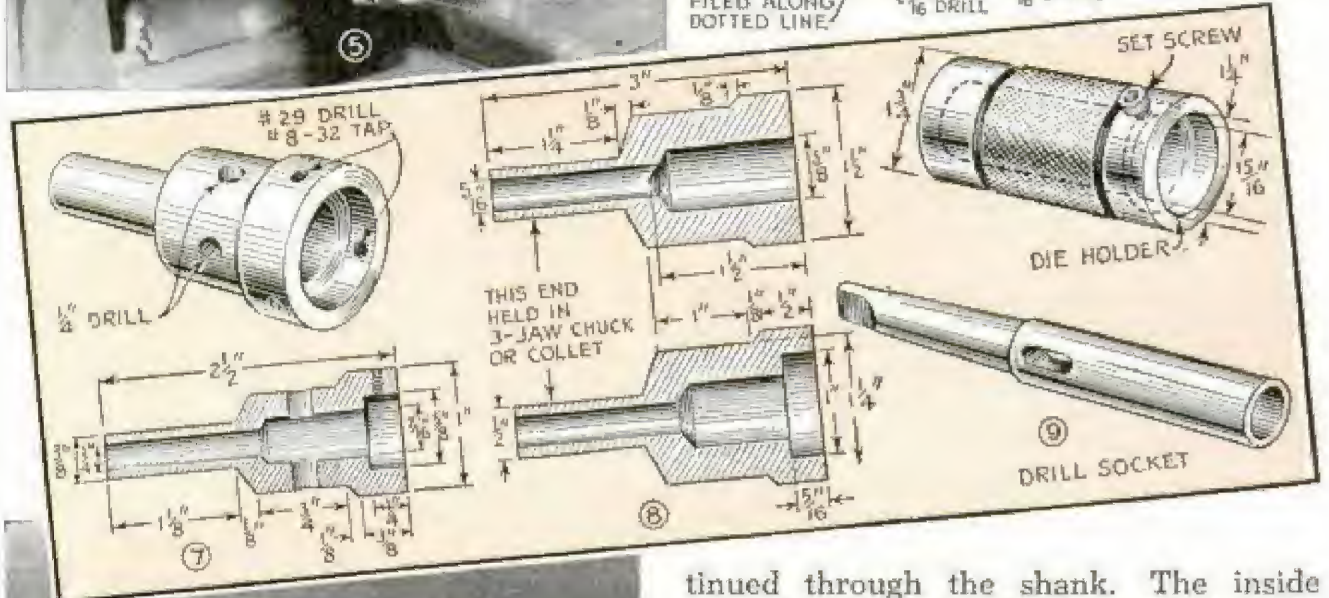
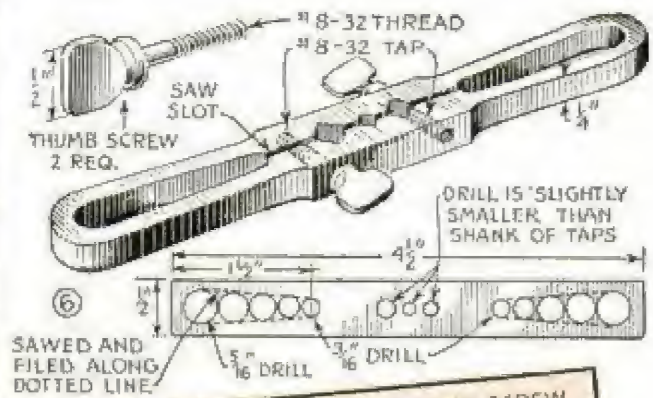
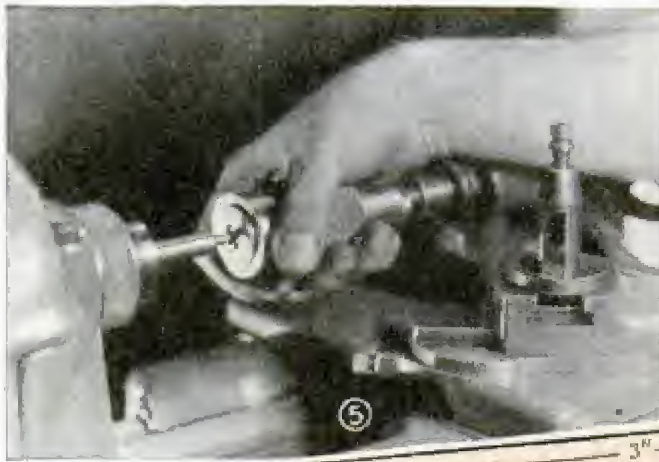
TAPPING and threading of work by hand or in a lathe is simplified, and the job is more accurate if these holders are used. Modelmakers in particular will find the combination tap wrench shown in Fig. 1 helpful. A length of brass bar stock, about 3 in. long, is drilled at the center to take the shank of the desired tap tightly. Two taps of the same size can be held in this manner, one being ground off at the end as a bottom tap, or two commonly used taps can be kept at hand, ready for use.

A wrench that will take various sizes of small taps is shown in Figs. 2 and 3. The jaws are shaped from $\frac{1}{4}$ by $\frac{1}{4}$ -in. steel bar stock, and the handles are made from drill rod. One end of each handle is turned



down and threaded to screw into the jaws as indicated. It is, of course, a job of only a few minutes to make larger wrenches of the same type to suit any job.

Another type of tap wrench is shown in Fig. 6. The handles are drilled, sawed and filed out as indicated, after which holes are drilled slightly smaller than the taps for which the wrench is intended. The holes



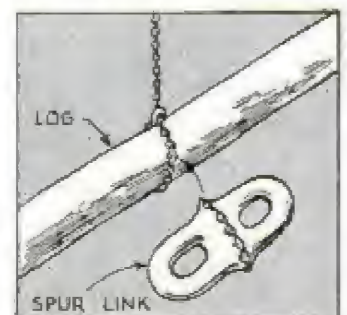
for the thumbscrews are also drilled at this time. Next a hacksaw slot is cut right down the center, from the opening in one end to that in the other. To accomplish this the blade is installed after inserting it into the shaped-out slot in one of the handle ends. The openings for the taps are then shaped to the desired size, with square files, and the holes for the thumbscrews are counterbored and tapped.

Useful attachments for threading work in a lathe are shown in Figs. 4, 5, 8, 9, and 10. They can be made in other sizes to hold all standard dies. Details of construction are shown in Fig. 8. These tools are made from cold-rolled steel. The outside is turned first, then the center is drilled out, and the central hole is con-

tinued through the shank. The inside shoulder is turned with the work held in a chuck or collet by the shank. Finally holes are drilled through the body and the collar is drilled and tapped for three set-screws. In use, the holder, with the proper size of die, is clamped in the headstock of the lathe, and the work is fed in by hand. A small pipe wrench or pair of pliers may be used to prevent it from turning. Because of the hollow construction of the die holder, long rods can be threaded for short distances or from end to end.

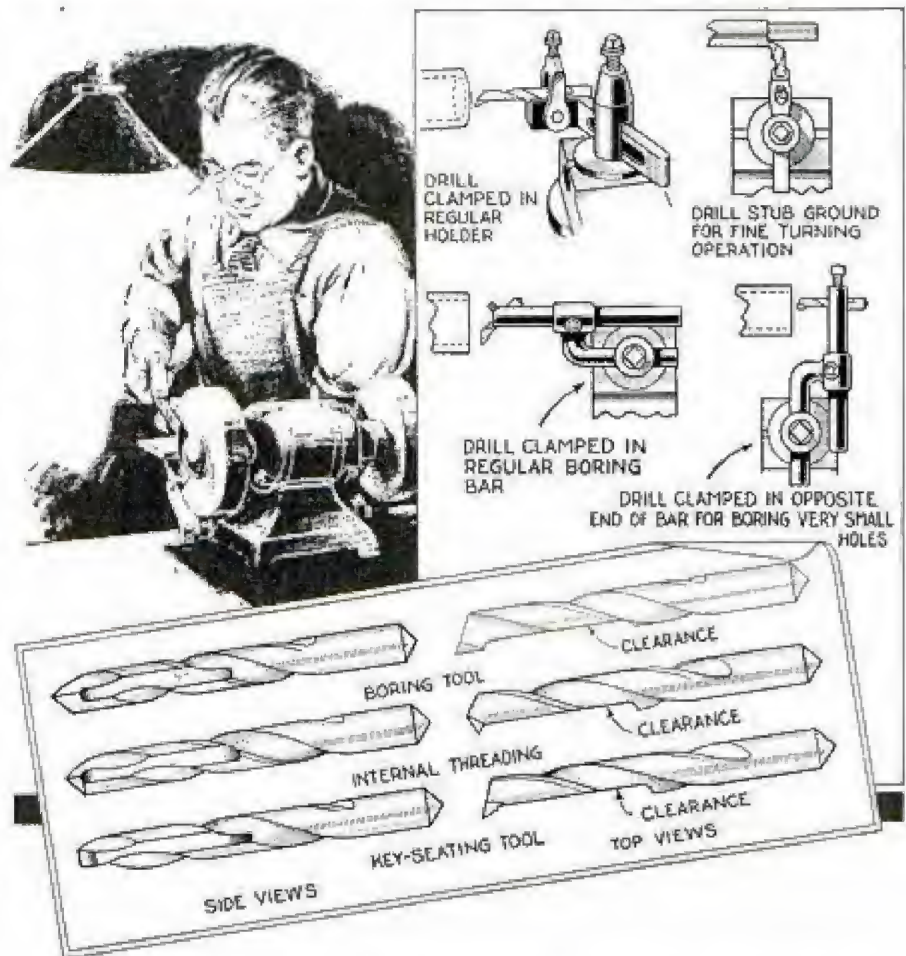
Spur Link in Chain of Hoist Prevents Slipping

To keep logs, timbers and other work from slipping out of the chain when hoisting them on a bridge job, one contractor put a spur link of the type shown in the chain where it contacted the work. The "teeth" of the link bit into the wood when a pull was exerted on the chain.



Good Lathe Tools from Discarded Drill Bits

Owners of small machine shops can reduce lathe-tool costs by utilizing broken, high-speed drill bits. A little grinding converts them into excellent tools for light jobs of boring, turning, threading, key-seating, etc. They can be gripped in most regular tool holders as indicated in the four upper details. The side views of the bits in the lower details show how the ends are shaped for three different tools, while the top views indicate how the bits are ground off on one side to give proper clearance. Of course, care must be taken in grinding to get the correct angles on the cutting edge. The overhang should not exceed that normally allowed.



Bin Protects Bolt Goods in Store When Taking Inventory

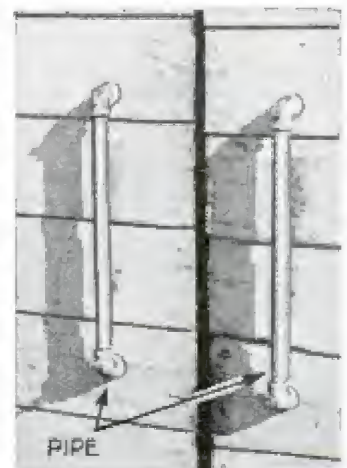
During inventory time when every bolt of material in a store must be measured, the unwound portion can be kept clean by running it into a bin attached to the counter as indicated. Two flat-iron hooks fit

into holes drilled into the counter, and as these are evenly spaced, the bin can be moved along from place to place.



Pipe Handles Open Heavy Doors

For opening heavy sliding doors, you will find handles assembled from pipe superior to the common type as they permit both hands to be used to exert a strong pull. The handles are about 20 in. long, and have elbows and floor flanges on the ends, the flanges being mounted on the inside surface of the doors with the elbows projecting through holes to the outside.

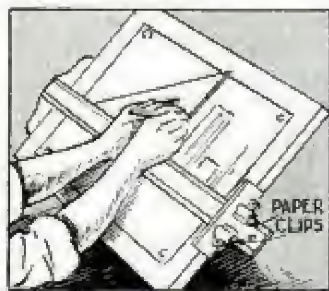


Water Tanks Emptied in Winter Serve as Feed Troughs



During winter, when some watering tanks are not used because of the danger of freezing, they can be converted to feed troughs. They are set in a fence as indicated, and three or four wood strips running from the top of the fence to the edge of each tank allow the animals to feed, yet prevent them from throwing out the contents. If desired, a swinging panel can be suspended above the tank to close the opening in the fence.

Clamp on T-Square to Grip Edge of Drawing Board



a strip about $1\frac{1}{4}$ in. wide and 6 in. long. In the center of this, make a slot to slip over

Draftsmen, artists and others will welcome this method of holding a T-square head to the edge of the board while working with triangles. From a piece of heavy cardboard or thin wood, cut

the T-square snugly. In use, place the T-square on the drawing board in the desired position, slip the piece of cardboard or thin wood over it, pulling it snugly against the edge of the drawing board. Then slip two large paper clips of the clamp type over the edges of the T-square to hold the cardboard snugly against the edge of the board.

Sizes of Firemen's Helmets on Brim Help Avoid Confusion

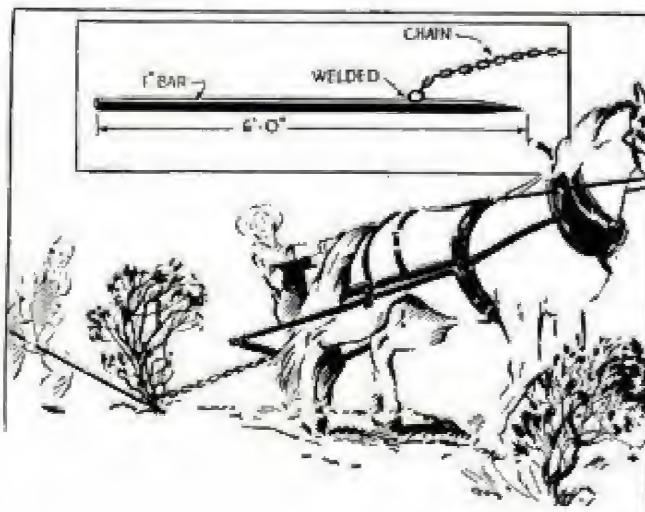
At the fire station of one small town, where the helmets were worn by various men at different times, the chief had the sizes of the helmets painted on the underside of the brims.

This enabled the men to pick instantly helmets that would fit without wasting time trying them.



Pointed Bar to Pull Brush with Horse or Tractor

If you have land to clear of small brush, you can do it easily with this tool and a horse or tractor. The tool is a 1-in. iron bar 6 ft. long and pointed at one end. It has an iron ring welded about 10 in. from the pointed end to take a chain to which the horse or tractor is hitched. In use, stick the bar into the ground on one side of the brush and hook the chain in the ring.

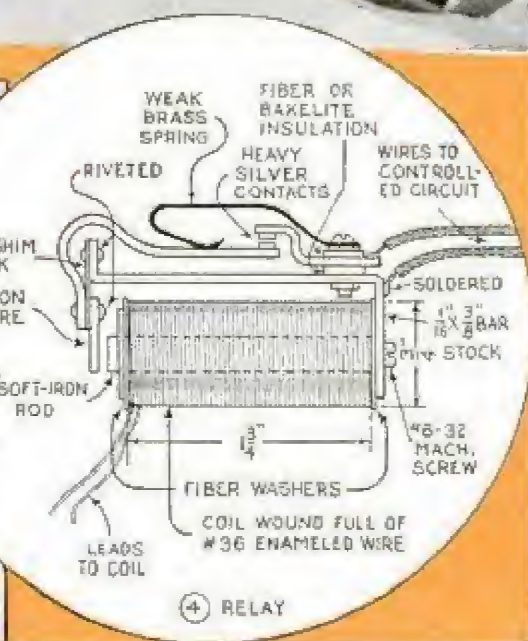
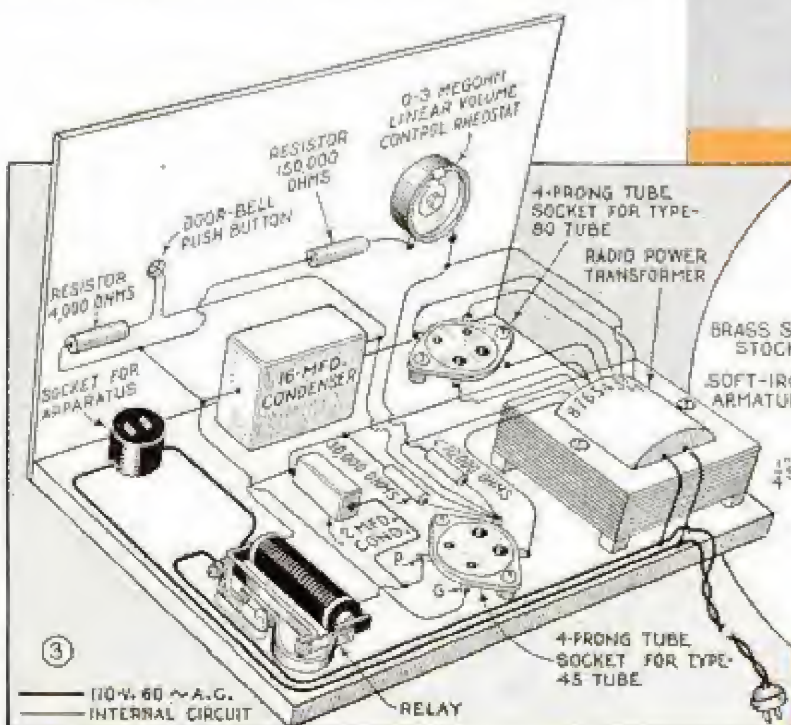
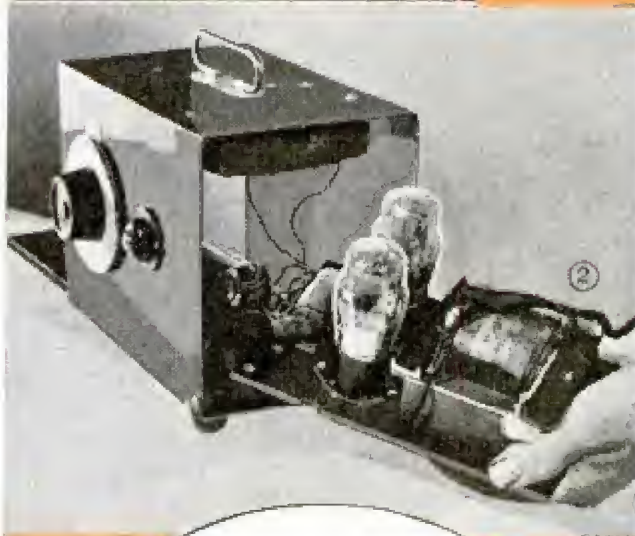


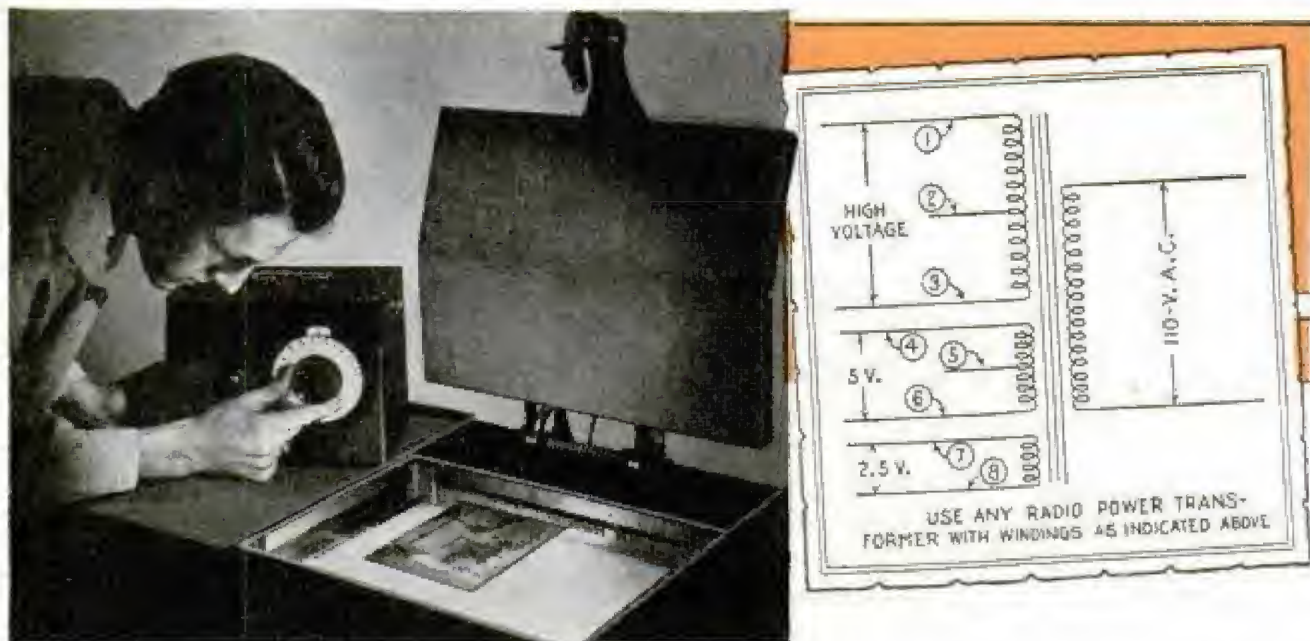
Split-Second PRINT TIMING

By C. A. CROWLEY

WITH this timer you can expose photo prints exactly to a predetermined timing within fractions of a second and thus eliminate variations beyond control when employing the usual type of manually operated electric printer. Thus slight under and over-exposures can be avoided, once you know the correct time for negative and paper. With the calibrated dial set for the time you wish to expose a print, Fig. 1, you merely close the printer lid, and press the button switch of the timer. That's all there is to it because the light of the printer will be turned off automatically. All duplicate prints will be the same if the dial setting is left unaltered. While the timer is of great help to the photographer, its usefulness also can be extended to operate other electrical devices for predetermined short intervals.

The unit makes use of a relay, a radio power transformer, a type-80 rectifier tube and a type-45 power amplifier tube. In addition, two condensers, one 16 mfd., (100-volt rating) and the other 2 mfd., (400-volt





rating) and a few resistors are required. The parts are mounted in breadboard fashion as shown in Fig. 3, or they can be arranged inside a box, as shown in Fig. 2, which may involve a slightly different grouping of the parts. The transformer can be any radio power transformer suitable for the voltage and frequency available, which has three secondaries, including one center-tapped high-voltage coil, one center-tapped 5 volt winding, and a $1\frac{1}{2}$ -volt winding. This is indicated in the last diagram, where the leads from the secondary taps of the transformer are numbered to correspond with those on the transformer in Fig. 1. The condensers used must be paper condensers; electrolytic condensers are unsuitable in this case. It may be necessary to connect a number of 1 or 2-mfd. condensers to make up the large condenser. The 0 to 3-megohm volume control is used to vary the interval during which the current is on, and it is important that a linear volume control be used. Many volume-control rheostats are so arranged that most of the resistance is at one end, which would make it more difficult to calibrate and adjust.

The relay, which you will have to make, is illustrated in Fig. 4. The core is $\frac{1}{4}$ -in. soft-iron rod, and the coil, which consists of No. 36 enameled wire, should be wound to a diameter of $\frac{3}{4}$ in. and a length of $1\frac{3}{4}$ in. The winding can be random instead of in exact layers. The spring is very important, as its function is to put a very slight tension on the armature, causing it to

break the contact rapidly and without chattering. It will require some careful adjustment by bending this spring to get the relay to operate satisfactorily.

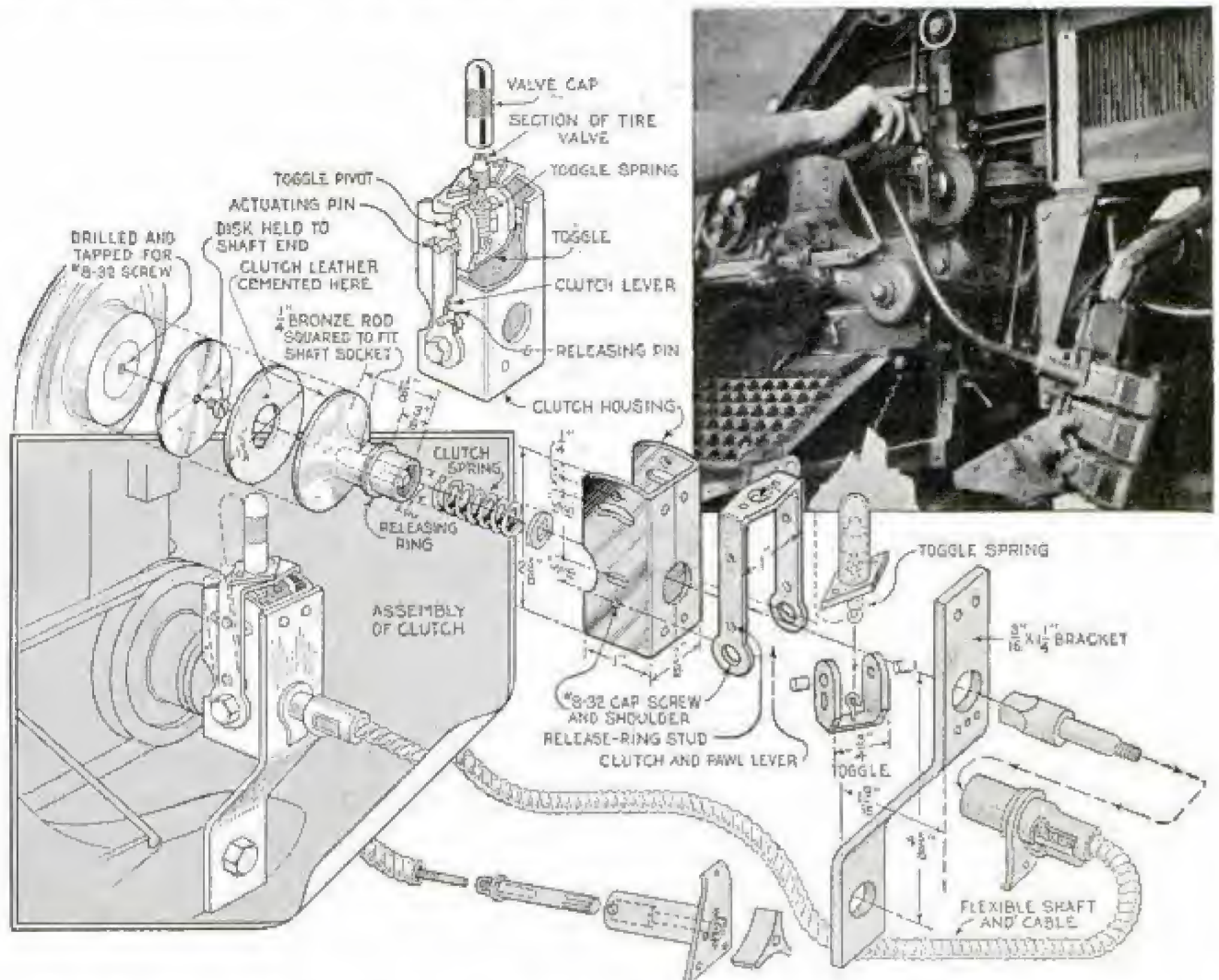
When everything is ready, plug into the line and connect to the printer. Depressing the push button momentarily resets the relay, which will then hold the circuit closed for a certain interval, depending on the adjustment of the volume-control rheostat. By setting the dial at various points and timing the lamp with a watch, it will be an easy matter to calibrate the dial in terms of time. The timer can be adjusted from a fraction of a second to several minutes. If longer time intervals are required, a larger capacity condenser or a higher resistance volume control is used.

Pigeon Perches from Cans

By cutting a couple of V-slots in a tin can, it may be converted into a perch for your pigeon pen. The slots allow the can to be anchored firmly on two nails or screws, which are driven into the wall to leave the heads projecting slightly. Such metal perches do not harbor insect pests and are easy to remove for cleaning.



Pi Stacker Operated by Clutch and Cable

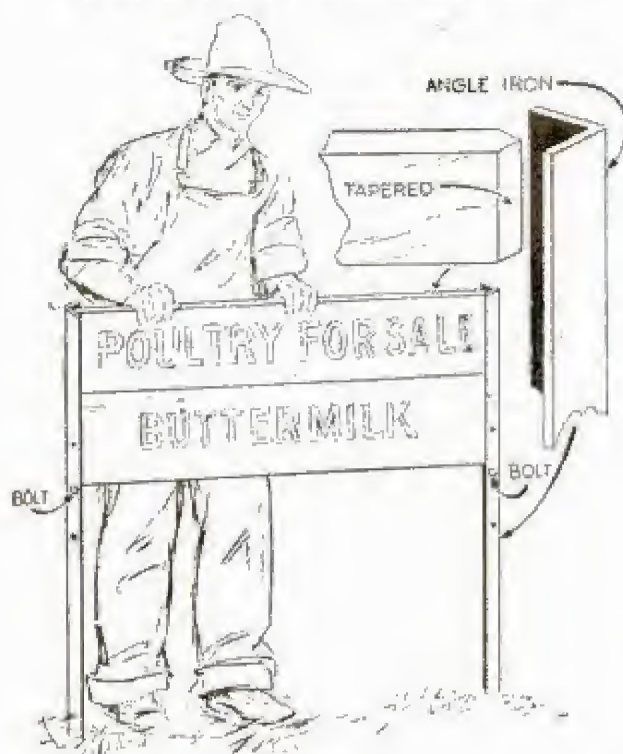


This flexible-cable drive eliminates the complicated belt arrangement on the pi stacker of some typesetting machines. The toggle throw-off makes it possible to disengage the clutch quickly, stopping the star wheel, if mats jam in the stacker. Even if this is not done immediately, the clutch will slip harmlessly until the operator flips the lever. The end of the shaft used as a source of power is rounded, but it can be squared easily with a file while the shaft is rotating under power. The center is found with a prick punch, also while the shaft is rotating, and a hole is drilled and tapped for the screw which holds the sheet-metal disk. The other disk, to which the clutch leather is cemented, is soldered to a section of tubing that holds the clutch spring. The releasing ring is a washer soldered to the tubing as indicated. A piece of $\frac{1}{4}$ -in. bronze rod, squared at one end to engage a socket on the end of the cable, is soldered in a hole in the cen-

ter of this disk. Both disks are made of 16-ga. sheet metal. The clutch housing consists of two identical pieces of 16-ga. sheet metal. These can be scribed, drilled and filed to shape while clamped together in a vise. The toggle, levers and pawl also are 16-ga. sheet metal. The bearing for the extended star-wheel shaft is made from a $\frac{1}{2}$ -in. collar partially filled with lead and drilled to fit the shaft. One end of the shaft is drilled to take the flexible cable and a washer is soldered on to act as a retainer. The spring in the clutch should be just strong enough to cause the star wheel to turn steadily, so the clutch can slip easily when a pileup of mats occurs. The spring in the toggle should be a small, stiff one to hold the clutch disks about $\frac{1}{16}$ in. apart when the toggle is in the "off" position.

☛ A good dead-black paint can be made by thinning lampblack, of the type ground in linseed oil, with turpentine.

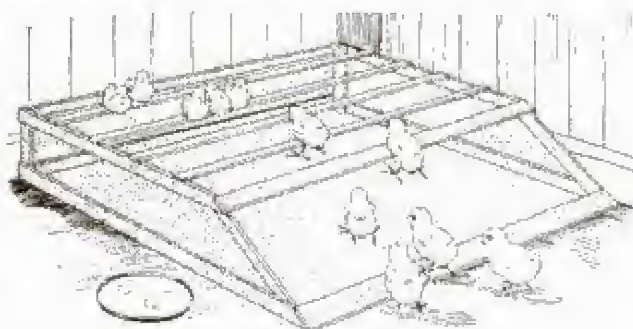
Changeable Roadside Signs Slip Between Two Steel Posts



Farmers and gardeners who wish to advertise produce along a highway will find this changeable sign convenient. It consists of two angle-steel posts, which are spaced apart a suitable distance to accommodate the sign boards required. Each board is tapered at the ends to fit easily into the V-shaped sides of the posts. Small bolts or pins are run through the posts to support the boards at the height desired.

Wire-Mesh Roosts for Chicks to Prevent Smothering

To train young chicks to roost and to prevent them from huddling together in a corner, which sometimes causes one or more of them to smother, try this wire-mesh roost. One end is shaped like a ramp enabling them to walk up to the roosts on which they will sit in preference to the

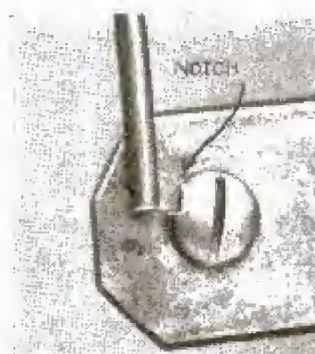


wire. If regular roosts are placed above these frames, the young chicks will later fly up to them.

—Stanley Russell, Vincennes, Ind.

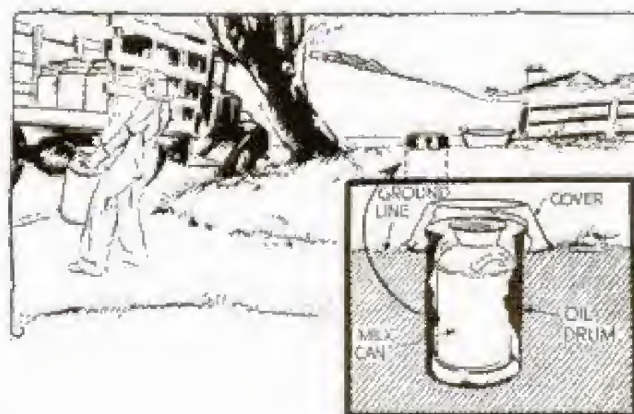
Large Machine Screws Loosened with a Punch

Before using large machine screws on a job where it may be necessary to remove them later, file a notch in the head of the screw, as indicated. Then if the screw should stick so tightly that it cannot be removed with a screwdriver, you can set a punch in the notch and loosen the screw by tapping the punch lightly with a hammer.



Sunken Oil Drum Keeps Milk Safe for Route Man

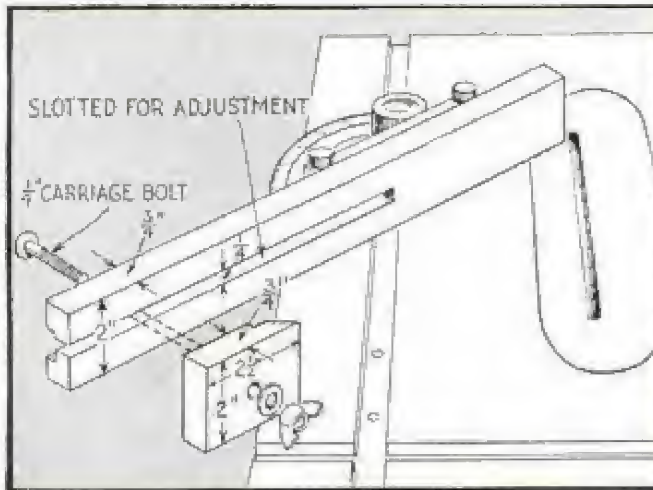
Patrons of a milk and cream route in Wisconsin have found that their product reaches the market in better condition if it is protected from heat in summer or



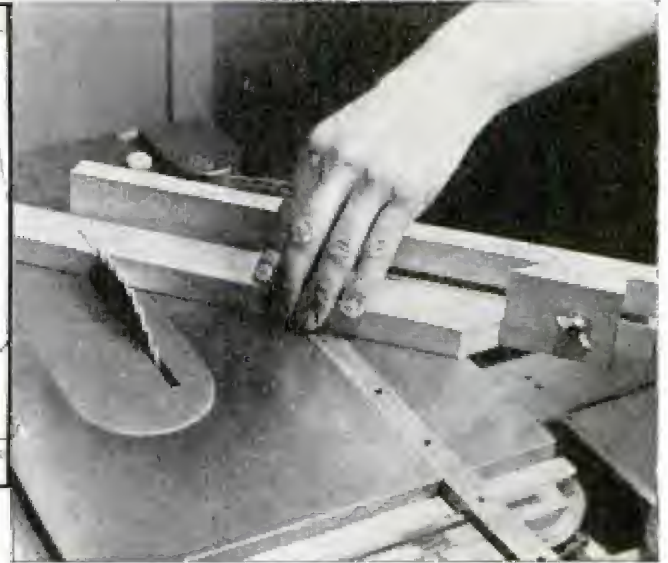
freezing in winter, by being stored in half buried oil drums at the roadside. The drums are covered with tubs, or other drum sections, to keep out rain or snow.

¶To protect paint on your window sills, give it a coat of clear shellac. When dry, apply liquid wax. Renew the latter treatment occasionally and the paint will retain its luster indefinitely.

Adjustable Stop Assures Accurate Miter Cuts



The next time you have a number of strips to miter to exactly the same length, take a few minutes to make this simple stop which will save you considerable work besides assuring accuracy. After the stop has been adjusted, any number of pieces can be run over the saw and they will all be the same length. The stop consists of a strip of $\frac{3}{4}$ -in. hardwood slotted as shown. Then a sliding block of the same stock is clamped to the strip with a carriage bolt and wing nut. One end of the



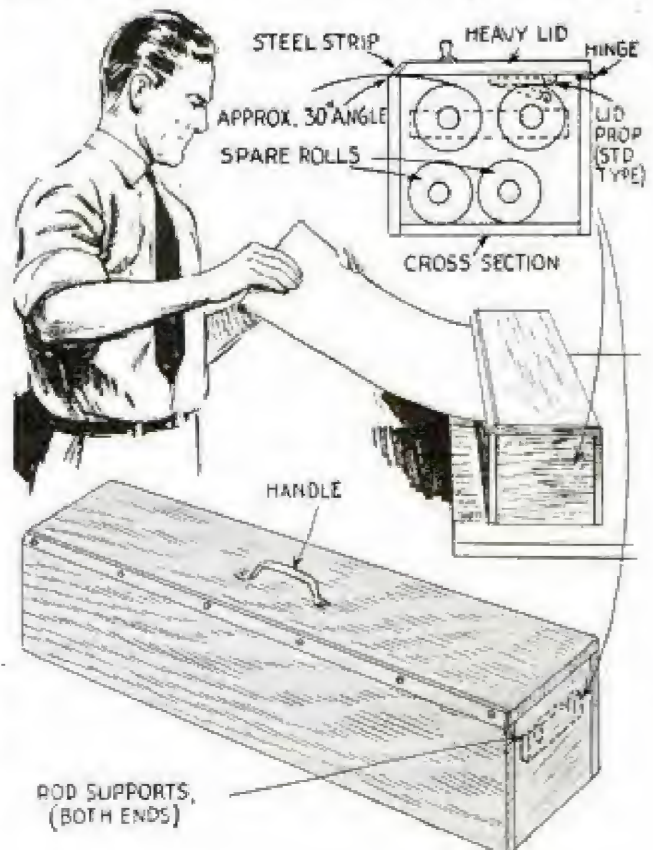
block is mitered. Note especially that a shallow groove is run down the inner edge of the miter cut. This is very important since it prevents wedging of chips or sawdust which might result in inaccuracy. To use the jig, run a miter cut on one end of each of the strips, then set the stop to give the length you want. Once the stop is set you can run the second cut on all of the pieces without changing it.

Drawing-Paper Dispenser Has Knife to Tear Off Sheets

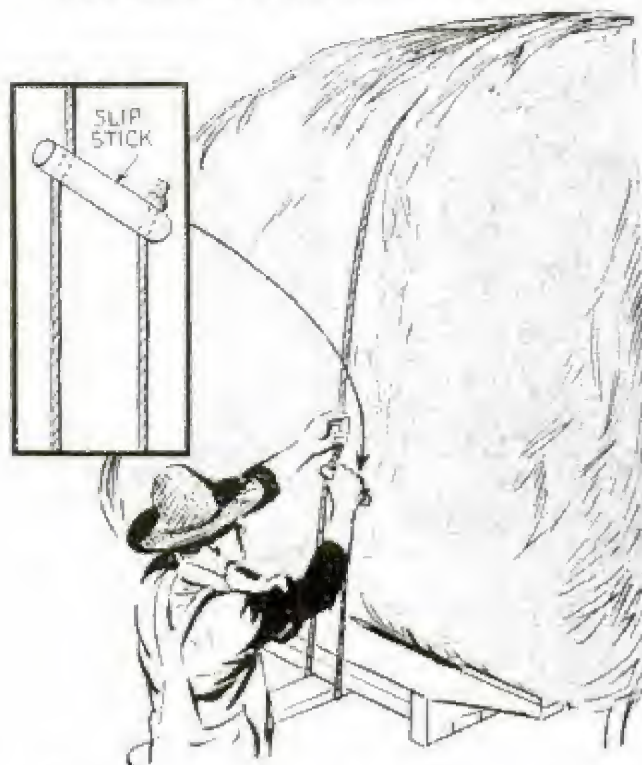
You'll find this cabinet handy for dispensing drawing paper because you just pull out the paper and tear off the required size sheet. The loose end of the paper does not turn back on the roll and you don't have to use weights. There's room for four rolls inside the cabinet, two mounted ready for unrolling and two spare ones. The cabinet is a rectangular box fitted with a lid, the front edge of which is beveled to a 30° angle and has a steel strip fastened to it for cutting the paper.

Machining Thin Metal Strips

When machining a thin strip of metal, tin one side and sweat-solder it to the tinned side of a thicker piece. Then the work can be machined extremely thin, tapered or shaped as desired because the extra piece gives a rigid backing. When the work has been finished, apply heat to the solder and separate the work from the backing piece.—E. Olson, Philadelphia, Pa.



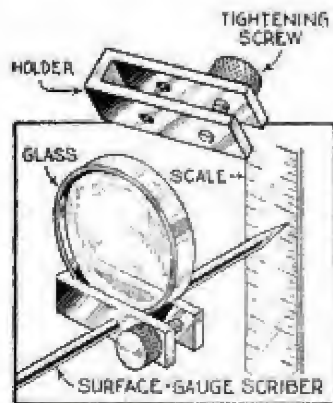
Rope and Slip Stick Substituted for Boom Pole on Hay Load



To secure a load of hay on a wagon, without using a heavy boom pole and knotted rope, one farmer uses a rope and slip stick. The rope is tied to the front of the rack, passed over the hay and fastened to the rear end of the rack. A slip stick, similar to those employed in adjusting tent ropes, is used to tighten the rope as indicated in the drawing.

Clamp Holds Magnifying Glass on Surface Gauge

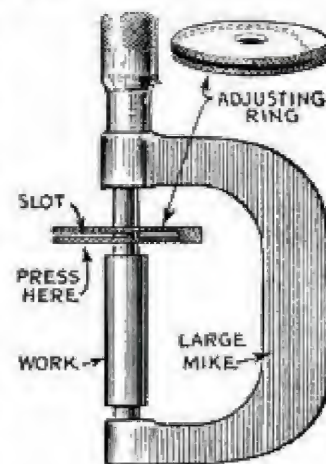
To set a surface gauge accurately to fine dimensions, it is best to use a magnifying glass. To overcome the awkwardness of holding the glass and setting the gauge at the same time, use this holder which clamps the glass to the surface-gauge scriber. The holder is a piece of flat steel bent to a U-shape, one end being drilled to take a thumb-screw and the other end being tapped for the same purpose. The U-piece is also



drilled to take the scriber as indicated. Inserting the rim of the glass into the piece and tightening the thumbscrew clamps it tightly to the scriber.

Clamp Ring on Micrometer to Adjust It

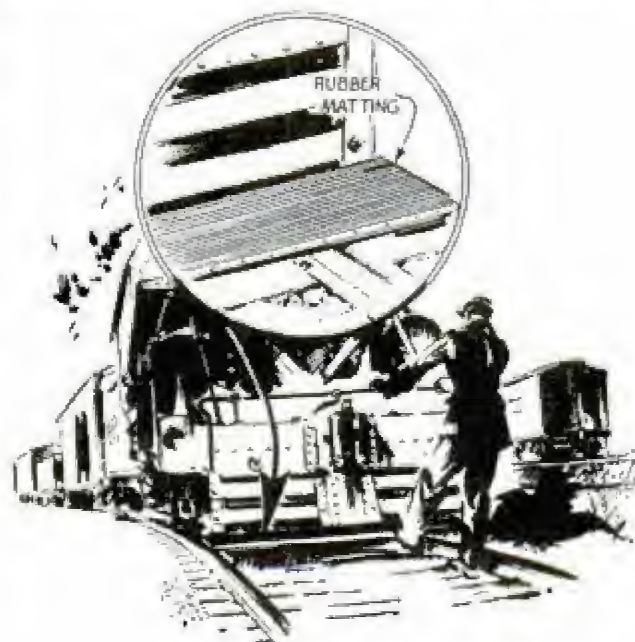
When using a large micrometer to measure work held in one hand, this ring on the spindle will enable you to adjust it easily with the fingers. The ring is a steel disk with a hole through the center, the hole being slightly smaller than the diameter of the micrometer spindle.



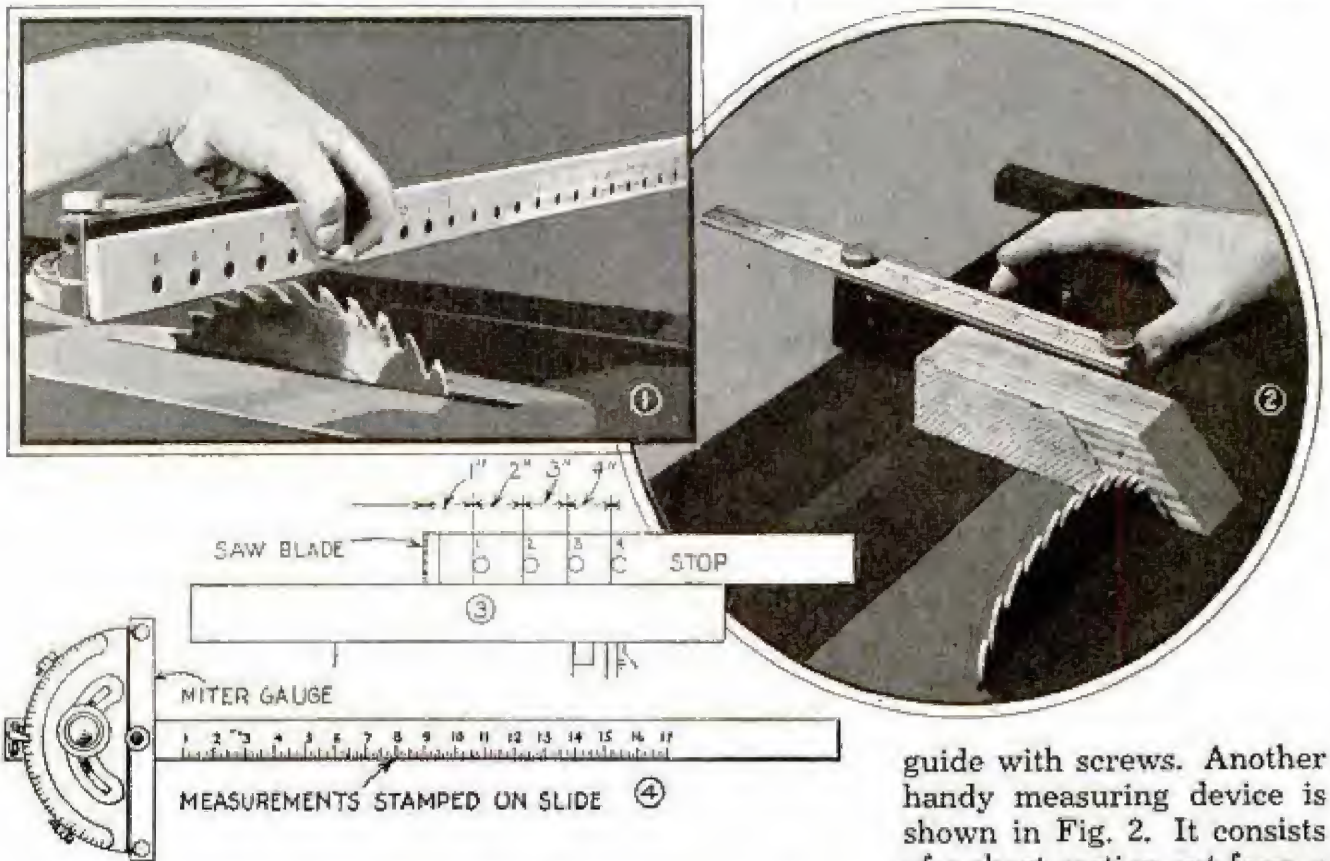
It is slotted transversely as indicated by the dotted lines on the detail. To slip the ring over the spindle, compress the slotted portion with the fingers. When released, the ring will grip the spindle tightly.

Rubber Mat on Locomotive Steps Reduces Slipping

To prevent wood steps on the front ends of some switch engines from becoming slick when wet, just tack or cement strips of corrugated rubber to the steps. This provides a good footing, even when wet.



Quick Measurements on Your Circular Saw



When you want to cut a number of pieces to exactly the same length, a stop like that shown in Figs. 1 and 3 will speed the job considerably as it is not necessary to measure and mark the stock before sawing. The arm attached to the crosscut guide may be of either $\frac{3}{8}$ or $\frac{1}{2}$ -in. hardwood with $\frac{3}{8}$ -in. holes drilled 1 in. apart along the length. A $\frac{3}{8}$ -in. dowel acts as a stop for the stock being cut. Fasten the arm to the crosscut

guide with screws. Another handy measuring device is shown in Fig. 2. It consists of a short section cut from a ruler or yardstick and screwed to the top of the crosscut guide. Bringing the end of the stock flush with any one of the graduations shows the exact distance from the side of the blade and also the length in inches of the piece when the cut has been made. Graduations on the arm of the crosscut guide are useful in checking width of the stock being sawed, Fig. 4. The graduations are easily stamped in the metal.

Wires Supported on Car Springs Keep Out Trespassers

A property owner, whose grounds adjoined a public park, was much annoyed by trespassers who would climb the fence in spite of warning signs. To avoid building the fence higher, he obtained several main leaves from discarded auto springs and attached one of these to each alternate post along the fence. Strands of barbed wire through the eyes in the ends of the springs were sufficient to discourage the climbers under ordinary circumstances.

¶The glass shield of a bench grinder can be made shatterproof by attaching a sheet of celluloid to the upper surface with cellulose cement.



A black and white photograph of a man in a suit standing in the doorway of a garage. The garage door is open, revealing a dark interior. The man is looking up at the door. The garage has a shingled roof and a sign that says "Ya" in cursive script.

Construction as shown in Fig. 2 starts, of course, with the concrete foundation and floor. Any good contractor will lay it or you may do the work yourself. Wall framing is spaced 16 in. on centers with double



TWO-CAR GARAGE



plates, headers and triple framing around the front doors, to secure a rigid, well built structure. First lay out and cut the pieces for the sills, as the holes for the bolts which fasten them to the concrete footing must be located and drilled. Then cut the plates and lay the lower ones next to the sills for marking out the centers of the studs on both pieces. Fig. 4 shows the location and size of the various openings.

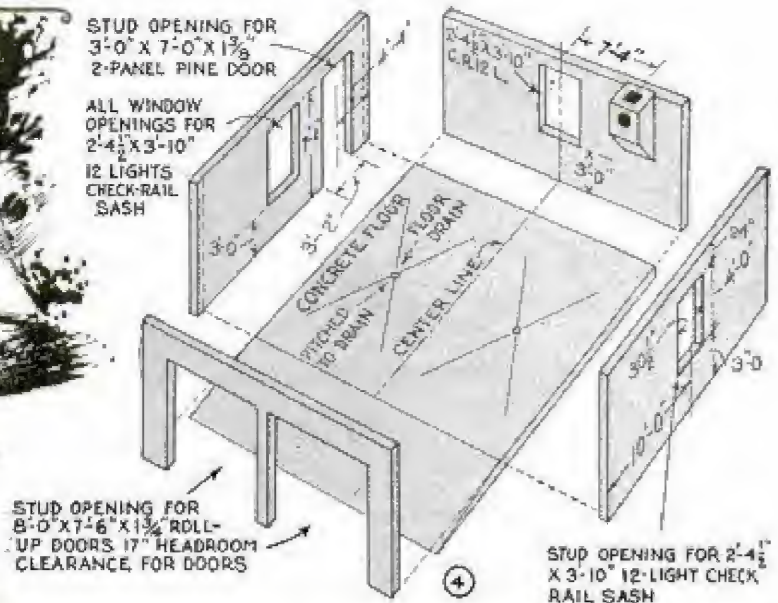
The sills are bolted into place, the corner members erected and held plumb with stay lath and a temporary crosspiece nailed on the outside between corners, against which the studs may be set. The lower plates, supported by one or two studs, are next installed, after which the rest of the studs may be spiked into place. Considerable waste can be avoided if the studs at the door and window openings are omitted when setting up the wall framing, and later cut to size before installing. The common practice is to install them all and then cut out the openings later. Installing the top plate completes the wall framing.

Fig. 14 shows a typical window and door framing. Note that the rough or stud openings are made about 1 in. larger all around than the size of the frames to allow for squaring and setting plumb. The special

framing around the large doors is shown in detail in Fig. 2.

Before putting on the siding, a strip of heavy tar paper is stretched across the studding and secured temporarily with pieces of lath. Standard drop siding in a design to simulate bevel siding is used. The siding is started at the bottom, working up and adding paper as required. This material is inexpensive and makes a reasonably tight joint when used with paper. The corner joints of the siding are covered with corner boards as shown in Fig. 9. By lapping the siding at the corners as shown, the nails are placed a safe distance in from the ends of the boards.

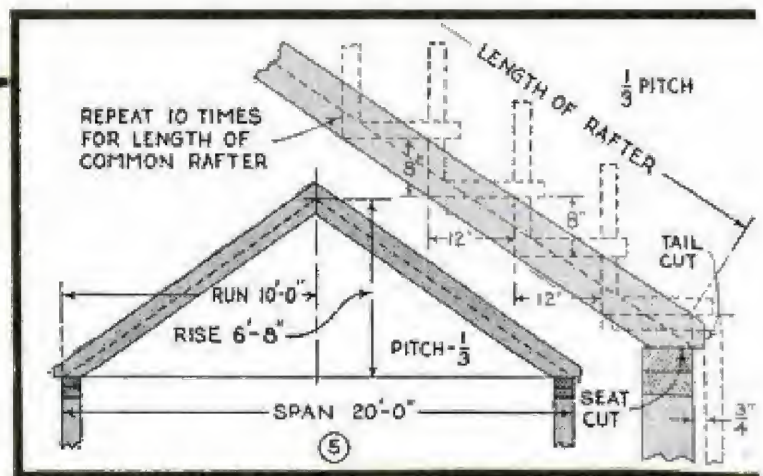
The hip roof has four equal sides so the framing is simplified because of duplicate parts. The pitch of the roof is $\frac{1}{4}$, or for every 12 in. of run there are 8 in. of rise. So for 10 ft. of run there is a rise of 6 ft. 8 in. at the peak, as shown in Fig. 5. There are three types of rafters in this roof. These are shown in Fig. 8 together with the cuts on the ends. To obtain the length of the common rafters, with the tail and seat cuts, place the square along the piece as shown in Fig. 5. However, as the rafter is mitered at the top, as shown in the detail of the peak in Fig. 2, a deduction of



1 1/4 in. from the length must be made. Fig. 8 shows by dotted lines the length and shape of the rafter before making this deduction. Notice that the cheek cut remains at the same angle.

As the hip rafters run diagonally to the common rafters, we use the diagonal of 12 in. or 17 in. as our unit of run. Setting the square at 17 and 8 you proceed just as for the common rafters in obtaining the length of the hips. The seat cut is the same also, but the tail and top cuts are mitered. In order to provide a level surface on which the roof boards may be nailed, bevel or "back" the edges of the hip rafters as indicated. The lines are located on the ends with a square then carried along the sides for sawing.

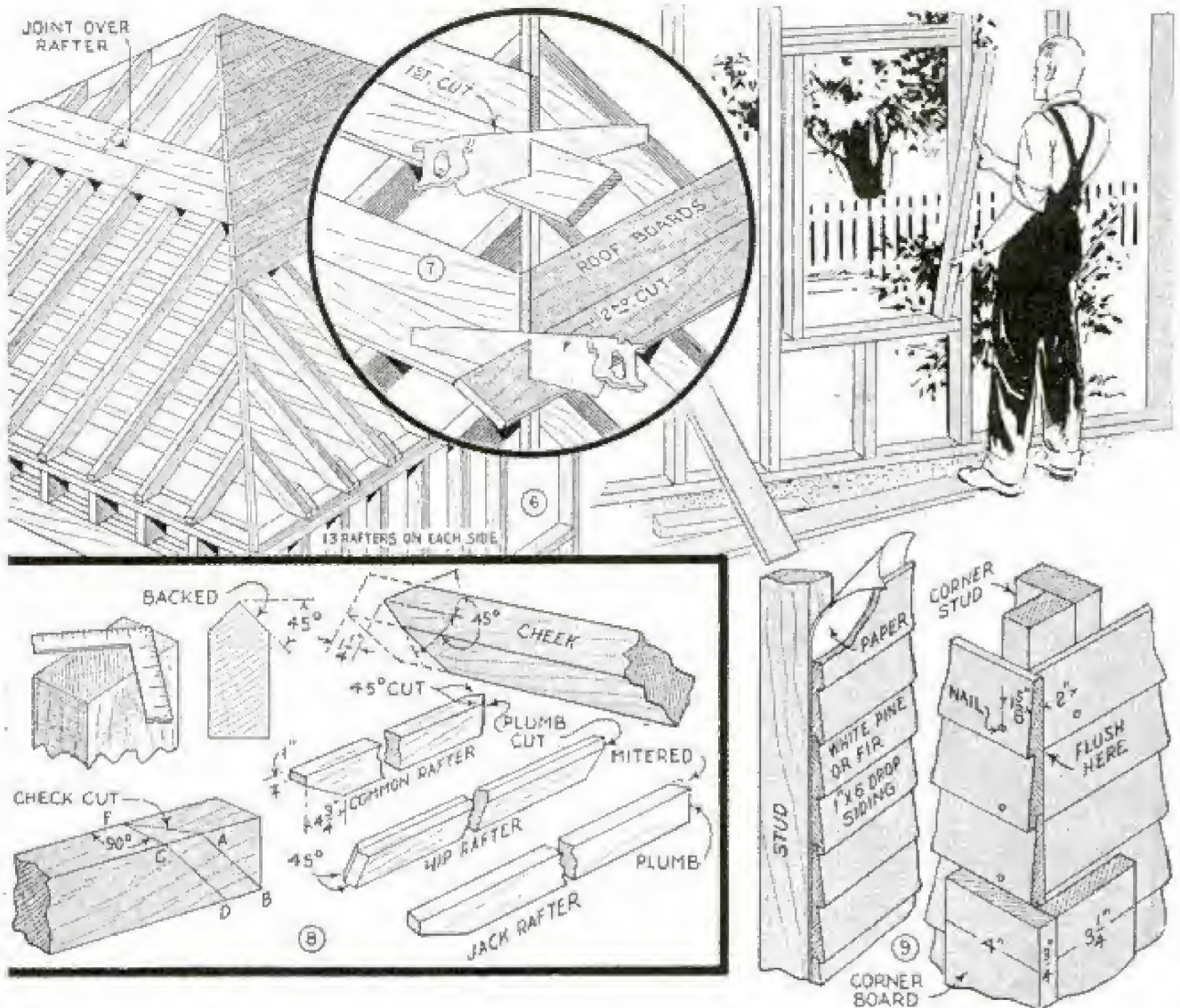
Perhaps the easiest way for the novice to determine the lengths of the jack rafters is by actual measurement of one set after the hip and common rafters are in place. The tail and seat cuts are made on six pieces of various lengths and these pieces held in position and marked, after which they may be used as patterns for the other seven sets. The miter cut at the upper end, by which they are fitted against the hip rafters, is determined in the following manner: First lay off the plumb cut A, B, just as for a common rafter. Now measure



the thickness of the rafter and draw the parallel line C, D. Square across the top to point F. A line drawn from F to A and A to B will indicate the line of the miter.

After all of the rafters have been installed, the ceiling joists should be fitted and securely spiked to both the plates and the sides of the rafters. To lay the roof boards, start at the bottom, nailing two or three boards into place then sawing off the waste stock at an angle so that the end is flush with the adjacent side of the roof, as shown by the first cut in the detail of Fig. 7. Proceed in this way to the peak. Now start the adjacent side in a similar manner, lapping the ends of the first side and sawing at the angle shown as the second cut in the detail. Follow around the roof, taking care that all joints occur over rafters as in Fig. 6. Either square-edge or tongue-and-groove boards may be used but the latter are generally considered preferable. A good grade of individual shingle, laid 4 in. to the weather, Fig. 10, completes the roof.

A molded metal gutter is used all around



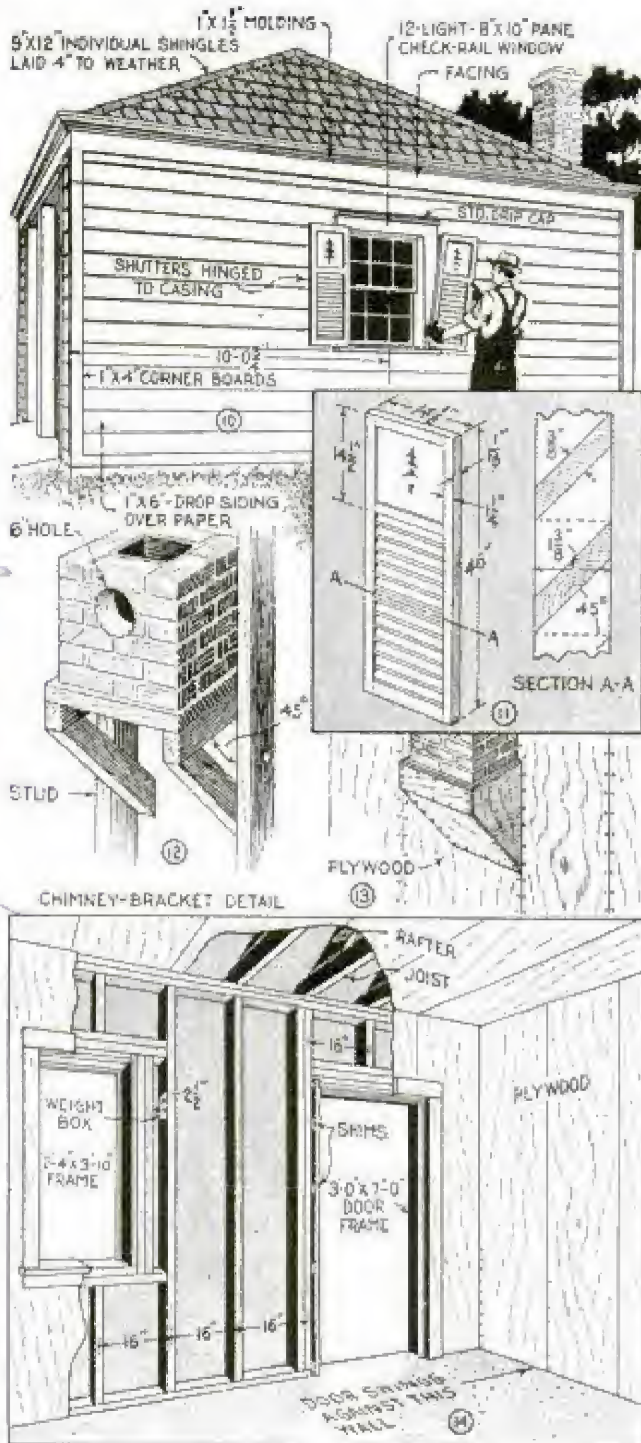
the roof to finish off the edges. A slight pitch should be given to the gutters so that they drain toward the back corner where a down spout is provided to empty into the drain. Standard window and door frames, sash and doors are used throughout. The shutters, however, are of special design, with fixed louvers, as shown in the detail of Fig. 11. Figs. 12 and 13 show the details of the chimney and the bracket upon which it rests. Any good coal, oil or gas-fired heater of suitable size will keep this well-constructed garage at a proper temperature in the coldest weather.

Overhead doors are perhaps the greatest advance in garage equipment in recent years. There are several rather similar makes on the market, any of which is entirely satisfactory. All of these doors are divided into sections horizontally and operate on a track. Because of a counterbalancing device, they operate so easily that even a small child can open or close them. All of them can be unlocked from

either side and if properly installed, according to the manufacturer's directions, should last for the life of the garage. The two essentials for the use of these doors is sufficient head-room and rigid door and ceiling framing, Fig. 2, so that the tracks will stay in line. Both are well provided for in this design.

There are also available several types of electric operators for over-head doors which are practical and very convenient as they may be operated from a distance and thus make it unnecessary to get out of your car to open or close the doors.

The proper installation of electric lights and control switches adds greatly to the convenience of a garage. A suggestion is given in Fig. 2. The usual center light should be controlled by three-way switches at both the center column, between the large doors, and also at some point near the service door. Another convenience is an outside light near the corner so that it will light both front and



service doors. This light should be controlled by two switches, one in the house and the other located near the service door. In addition you will want outlets near the front of each car stall for trouble lamps or other appliances.

A water line in the garage is also a convenience that should be considered. This consists of an underground line from the house which is brought up near the center of the rear wall.

MATERIAL LIST

- 60 pcs. yellow pine 2 x 4 in. by 10 ft.
(for studs and corners)
- 10 pcs. yellow pine 2 x 4 in. by 16 ft. for plates
- 3 pcs. yellow pine 2 x 6 in. by 20 ft. for girder
- 9 pcs. yellow pine 2 x 6 in. by 8 ft.
(for door studs, sills, etc.)
- 3 pcs. yellow pine 2 x 4 in. by 20 ft. for sills
- 15 pcs. yellow pine 2 x 4 in. by 20 ft.
(for ceiling joists)
- 4 pcs. yellow pine 2 x 4 in. by 18 ft.
(for hip rafters)
- 16 pcs. yellow pine 2 x 4 in. by 14 ft.
(for common jack rafters)
- 18 pcs. yellow pine 2 x 4 in. by 12 ft.
(for jack rafters)
- 4 pcs. fir or white pine 1 x 3 in. by 20 ft.
(for cornice)
- 4 pcs. fir or white pine 1 x 6 in. by 20 ft.
(for facing board)
- 6 pcs. fir or white pine 1 x 6 in. by 8 ft.
(for door casings)
- 2 pcs. fir or white pine 1 x 3 in. by 8 ft.
(for door trim)
- 1 pc. fir or white pine 1 x 8 in. by 8 ft.
(for door division panel)
- 720 sq. ft. yellow pine matched roofing, 1 x 6 in.
- 720 sq. ft. fir or white pine drop siding, 1 x 6 in.
- 20 fir plywood panels, $\frac{1}{4}$ x 48 in. by 10 ft.
(for walls and ceiling)
- 2 roll-up doors 1 $\frac{3}{4}$ in. by 8 x 7 ft. 6 in.
- 1 two-panel fir service door 1 $\frac{3}{4}$ in. by 3 x 7 ft.
complete with frame, trim and hardware
- 3 check-rail windows with 12 lights, 2 ft. 4 $\frac{1}{2}$ in.
by 3 ft. 10 in. complete with frames,
trim, etc.
- 600 sq. ft. asphalt shingles
- 80 linear ft. molded gutter with downspouts
- 600 sq. ft. building paper

Skinning of Small Animals Simplified by Compressed Air

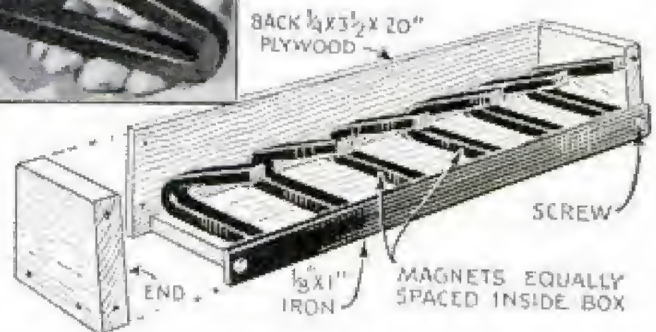
Trappers and taxidermists can use this novel and practical method of skinning small animals. Instead of beginning the job with a sharp knife as is usually done, you first inflate the skin with compressed air, thus breaking loose the tissues that hold it to the carcass. This is done with an ordinary tire pump and a hypodermic needle, the latter being soldered to a valve stem and the assembly in turn screwed to the hose attached to the pump. Care must be taken to insert the point of the needle just

under the skin and close to an incision which will be made later in removing the hide. If the pelt is to be open-skinned, the needle can be inserted through the hide at some point along the underside of the belly. Where the pelt is to be skinned by the cased method, insert the needle on the underside of the hind leg. Do not inflate the skin more than necessary to break the tissues. After inflating and making the incisions, the pelt can be removed easily.

—J. R. Stafford, Hayden, Colo.

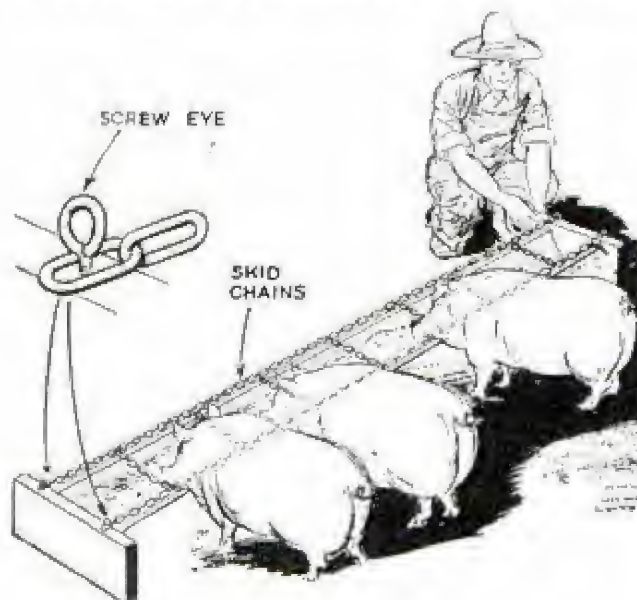
This Magnetic Rack Holds Small Hand Tools

The usual array of small tools that clutter a bench when you are working, can be stored efficiently on this magnetic rack. It will support pliers, screwdrivers, compasses, chisels, small wrenches, etc. Just place them against two iron strips which contact the faces of several magnets. Model-T Ford magnets are well suited for the purpose. They are placed in a rack made as indicated and the iron strips are screwed to the front of the rack at the top and bottom. It is important that like poles of the magnets be matched throughout, otherwise the pull will be lessened greatly. The poles can be matched by holding two magnets together as indicated in the center photo. If they show no attraction for each other when held together in this position, the like poles are together, but if they cling to each other, one of the magnets must be turned over.



Detachable Dividers for Hog Trough from Auto Skid Chains

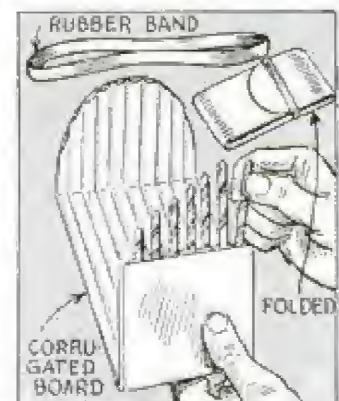
To keep hogs from fighting over feed in a trough, one farmer uses old car or truck skid chains instead of wood cleats, which usually make it difficult to clean the trough properly. The chains are stretched taut and are fastened by screweyes, which are driven into the ends and sides of the trough and run through links of the chain.



Turning the heads at right angles to the links keeps the latter from slipping off the screws. When the screw heads are turned back parallel with the links, the chain can be lifted and removed for cleaning.

Cardboard Holder for Drills Carried in Pocket

Finding it convenient to carry small drills in his pocket while working on a job away from his shop, a carpenter made this holder from a piece of corrugated cardboard. After cutting the cardboard to the proper shape and folding it as shown, the drills are inserted into the corrugations, the flap of the holder being held in place by a rubber band.



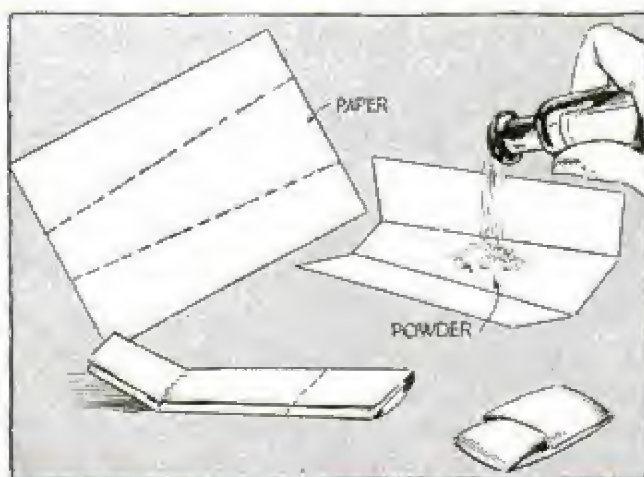
Chicken Is Held over a Barrel When Plucking Feathers



To hold fowls conveniently for plucking, one produce merchant uses a simple, detachable wire clip and hook which support the birds over an open barrel, in which the feathers drop. The clip is pushed between the barrel hoop and staves to engage the bird's feet, while the hook is attached to a rubber band anchored on the side of the barrel. The hook engages the neck and stretches the carcass across the opening. The hook and clip are made of heavy wire.

Physician Folds Papers of Powder to Seal Them

When filling a prescription that contains different powders, one physician puts them in small pieces of paper, which are then folded to seal them tightly. To do this, the paper is folded as indicated by the dotted



lines so that it tapers toward one end. Then both ends are folded over and the smaller one is inserted into the opening of the larger end.

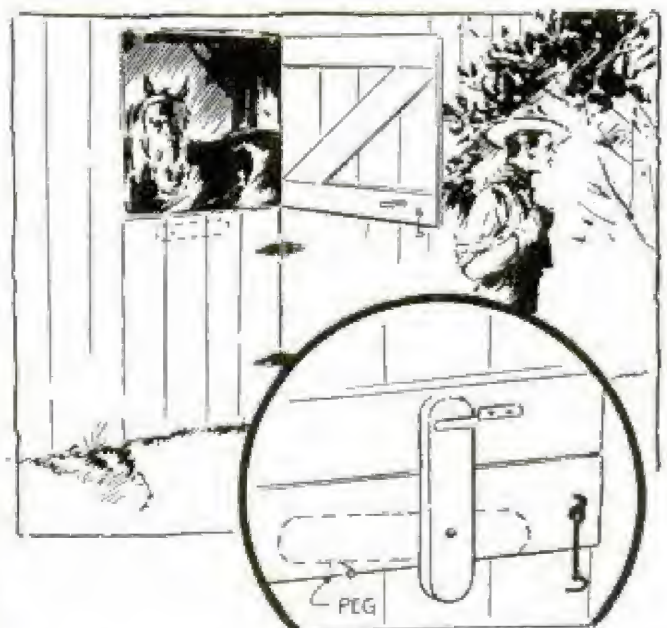
Magnifying Glass on Centerpunch Assures Accuracy

If you are using a centerpunch on work where accuracy is necessary, a magnifying glass attached to the punch as indicated will be helpful. The glass is of the type inclosed in a metal band to which strips of metal are soldered so that the assembly can be clamped to the punch as shown.

—Michael F. Wolf, Minneapolis, Minn.



Sectional Stable Doors Operated as One Unit with Latch

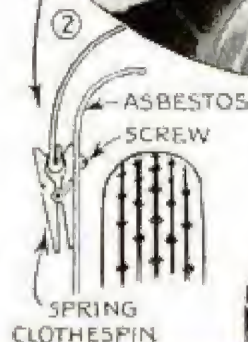


Barn doors of the two-section type may be operated as a single unit by use of the pivoted latch shown in the circular detail. To do this, attach a wooden pivot latch to the upper crosspiece of the lower door to engage a flat-iron hook on the lower crosspiece of the upper door. When not in use the latch rests on a peg or nail which supports it in a horizontal position out of the way, allowing the door to open separately.

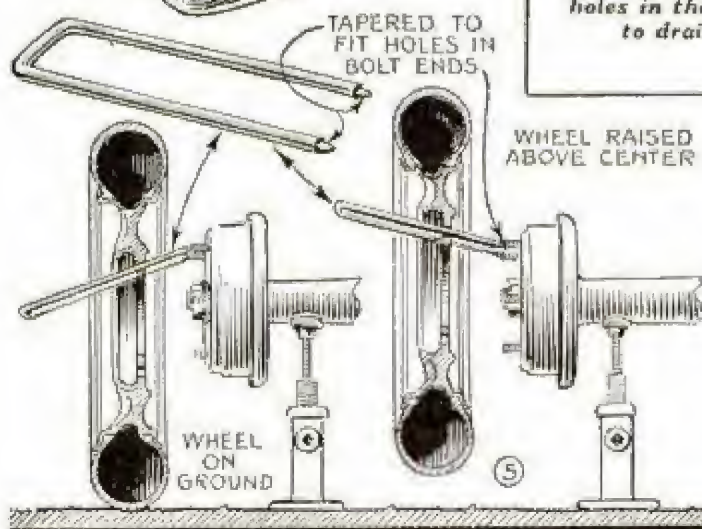
Hints for AUTO MECHANICS



1, You can release a Ford V-8 clutch for cold-weather starting and close the starter switch with one foot by turning the latter sideways so that the heel touches the switch button. 2, an asbestos shield attached to clothespins with screws protects the tire and wheel when welding a damaged fender. The clothespins are clipped over the fender edge



A good place to carry your extra car key is on top of the felt pad in the air cleaner as in 3. Oil pumping of model-A Fords often can be reduced by drilling $\frac{3}{8}$ -in. holes in the splash tray as indicated in 4, to drain excess oil into crankcase



The tool in 5 will help slip a heavy wheel over the bolts of the brake drum. Drill holes in the ends of two adjacent bolts, bend an iron rod to a U-shape and point the ends. Slip the tool through the holes in the wheel and work as indicated. To help keep moisture out of your headlamps, press a paraffin-coated string into the joint between the lens rim and the lamp housing as indicated in 6. Use a string large enough to fill the joint



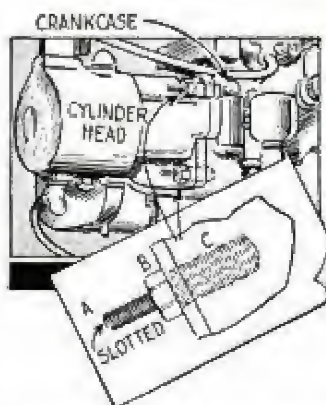
Small Bearings Removed Quickly with Improved Puller



Removing starter, generator and other small bearings is easy with this improvised puller, which is assembled from a short piece of flat iron and a couple of carriage bolts. On most jobs it is not even necessary to take the generator apart; just slide the armature shaft out of the bearing far enough to let the bolt heads slip over the rear side of the race. In some cases, it may be necessary to insert the bolts separately and then slip the bar over the threaded ends. A pry under the bar will pull the bearing. For larger bearings use a heavier bar and larger bolts.

—M. W. Mutschler, Lincoln, Nebr.

Use Larger Stud in Crankcase When Threads Are Stripped



If you strip the threads of a hole in an aluminum crankcase, a repair can be made by reaming out the hole and tapping it to take a larger stud. The portion of the stud that projects from the case should be

turned down to the same diameter as the one used first and then threaded. A screw-

driver slot sawed in the projecting end of the new stud will enable you to drive it into the hole.

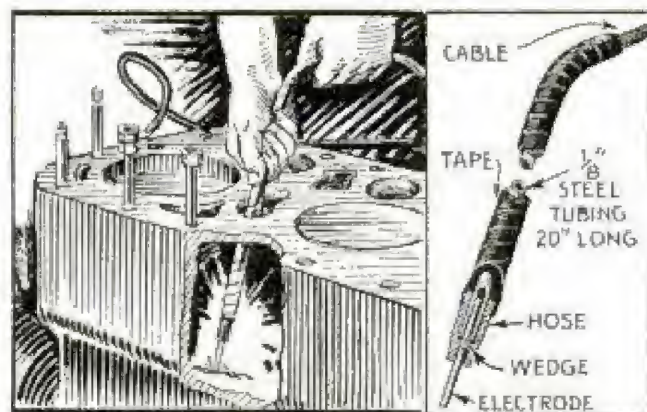
—Karl Melvin, Halifax, N. S., Can.

Protecting Control Cables

To protect motorcycle control cables from chafing where they rub against parts of the machine or where they pass through holes in the handlebars or other tubing, it is a good idea to cut suitable strips from a tobacco tin and wrap these around the cable at the point where the chafing occurs. The tin guards can be soldered in place or fastened with a strip of friction tape.

Welding-Rod Holder Insulated When Repairing Motor Block

In order to weld a crack in the water jacket around a cylinder, the electrode of an electric welder had to be inserted through the small water openings in the



top of the block as shown. To do this without causing a short circuit, the welding cable was attached to a piece of small steel tubing in which the electrode was wedged. A piece of rubber hose was slipped over the joint between the electrode and tubing, after which the entire assembly was wrapped with tape. In one instance a weld was made through a 1-in. hole while the worker watched the job through another hole.—Jos. C. Coyle, Yuma, Ariz.

"Dry-Ice" Tests Shock Absorbers

As shock absorbers of the hydraulic variety wear they become less effective. In some instances, heavier fluid will give the ride desired, but it is not easy to drain, re-

fill and try heavier fluid. A piece of Dry-Ice wrapped to each shock absorber with a rag will give the same effect. The lower viscosity resulting from chilling the shock absorber will give the effect of riding with heavier fluid. Then if the effect is what is wanted, the units can be drained and filled with heavier fluid.—C. E. Packer, Chicago.

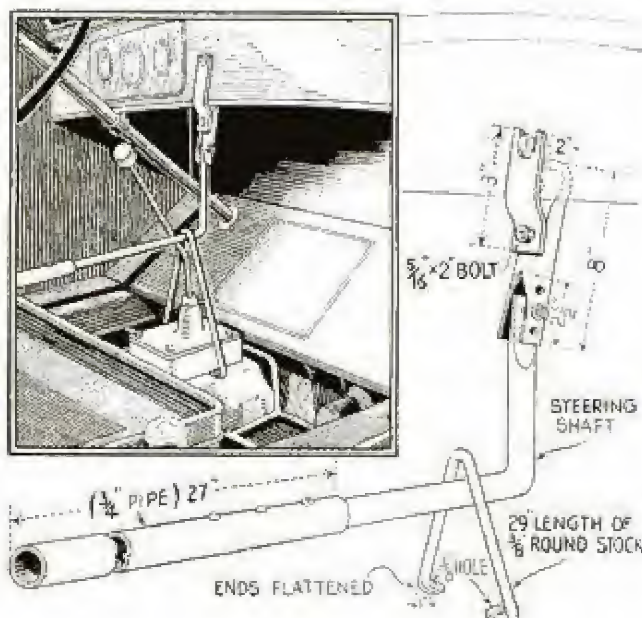
Cheap Garage for a Motorcycle

Motorcyclists who use a waterproof sheet to protect their machines when not in use, will find the following tip useful: Take two sleeves from an old jacket or coat and sew them into the sheet so that they can be slipped over the handlebars to prevent the sheet from blowing off.

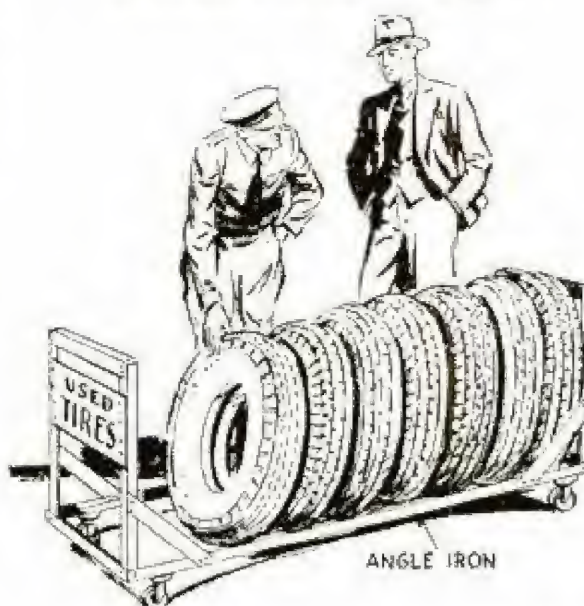
Heavy Transmissions Installed or Removed Easily

Here's a simple tool that will enable you to remove or install heavy transmissions single-handed. Also, it is handy for supporting them while installing or repairing a clutch. The tool consists of an L-shaped lever with a telescoping handle which can be adjusted for length. The short end of the lever is pivoted to an improvised clamp, which can be fastened to the instrument panel to provide an anchorage. A length of round stock bent to a V-shape and flattened at the ends slips over the handle and is fastened to cap screws or studs in the transmission to lift the latter.

—Otto Seeliger, Chicago.



Wheeled Rack to Display Tires Moved Inside at Night

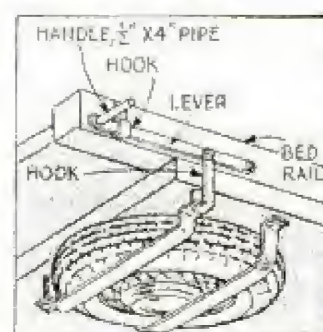


Service-station owners who handle used tires will find this wheeled display rack a labor saver as it can be loaded and moved to any spot on the premises and then moved inside the building at night without handling the tires. The rack is assembled from angle iron, which is riveted together, the wheels being heavy trunk casters mounted at each corner.

—Hugh Lineback, Siloam Springs, Ark.

Spare-Tire Rack on Truck Lowers to Receive Extra Wheel

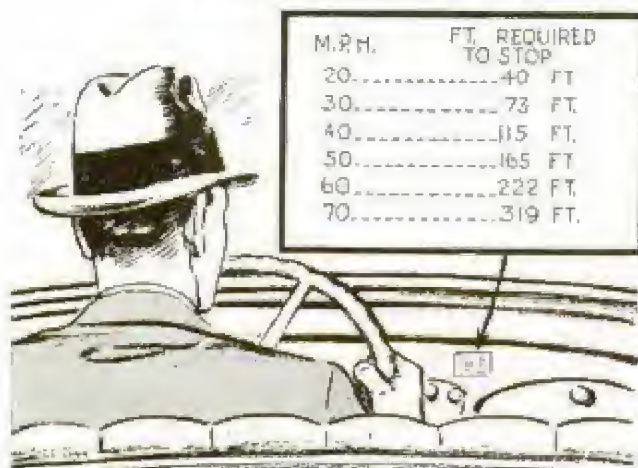
Instead of lifting a heavy tire and wheel to slide it into the spare-tire rack underneath the body of a truck, one driver altered the rack so that one of the supports could be lowered with a lever. This saved considerable labor in removing or replacing the wheel.—Don Smith, Chehalis, Wash.



This saved considerable labor in removing or replacing the wheel.—Don Smith, Chehalis, Wash.

❑ If you have an idea that might be used for a short article in these pages, send it to the Homecraft Editor. Inclose a snapshot or drawing and give all the necessary information in as few words as possible. To be accepted, material must be of general interest and different from any we have published previously.

Chart of Feet Required to Stop Aids Car Driver



Finding that younger members of his family who drove did not realize the distance required to stop a car safely at a

certain speed, one motorist made up the chart shown and fastened it to the instrument panel in plain sight. After showing the drivers how to approximate distance by sight, they were able to stop safely without sliding the wheels, the chart giving them the required distance at a glance. Also, it served as a reminder to keep the speed down.

Trailer Has Built-In Level

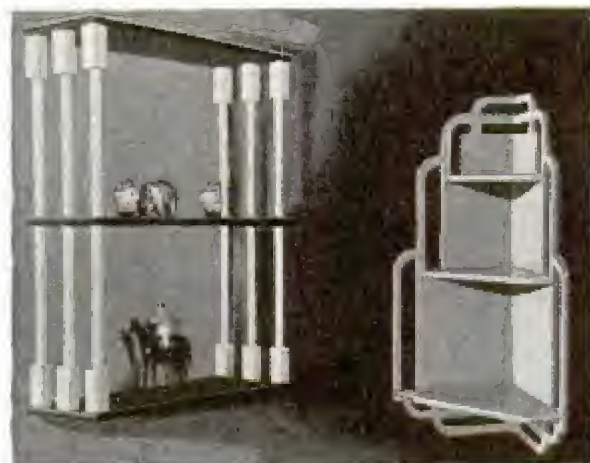
Two small spirit levels fastened to window of a trailer will prove a timesaver. They may be placed in different locations if desired, but they must be set at right angles to each other in order to read correctly for lateral and longitudinal leveling of the trailer.

—A. H. Vance, McNaughton, Wis.

Plan-of-the-Month—A New Service

How to get a collection of plans designed by leaders in craftwork

Complete, easy-to-follow plans, including photos, material list and full instructions on building simplified but worth-while articles with generally used hand tools. No previous experience necessary



Every home needs something like this to add an artful, delicate touch to large expanses of bare walls, or to add charm to uninviting corners

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for bric-a-brac and whatnots in the home. Either one of these can be put together and attractively finished in an evening or two at the handicraft bench.

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Craftplan shows and describes every detail and process of assembling step by step. New, simplified method of illustrating followed. Contains full-size patterns for scroll-sawing which you can trace directly on the wood. Also suggestions to obtain beautiful, pleasing finish.

START A HOME WORKSHOP

Why not get into home woodcraft? For the novice, such subjects as these shelves are just right as a starter. Besides getting the benefit of recreation, the useful things produced often can be sold at a profit.

With Eastman's new HIGH SPEED FILM any camera takes NIGHT SNAPSHOTS in its stride



About four
times as fast
as ordinary film



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1. Your present camera loaded with the new Kodak Super-XX Film
2. A couple of inexpensive Mazda Photoflood lamps in Kodak Handy Reflectors

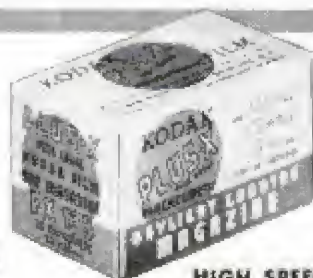


EASTMAN'S new four-times-as-fast film enables every one to make snapshots at night, regardless of his equipment. You need less light indoors than ever before; you use any camera that takes the new Kodak Super-XX Film—even an inexpensive Brownie. The pictures you get are not stiff and posed, but the same informal, spontaneous, true-to-life shots you snap outdoors.

FREE BOOKLET . . . This little booklet introduces you to one of picture taking's biggest thrills—snapshots at night. A single reading, and you're ready to make nighttime snapshots you'll be proud of. Interesting photographs, easy-to-understand diagrams, and light arrangements. At your dealer's . . . Eastman Kodak Company, Rochester, N. Y.



Eastman's
THREE
NEW FILMS
meet every
picture-taking
need



**HIGH SPEED
AND FINE GRAIN**

KODAK PLUS-X FILM, in miniature sizes only . . . Combining both increased speed and fine grain, the ideal all-round film for miniature camera use.



EXTREME SPEED

KODAK SUPER-XX FILM, in miniature and other popular amateur sizes. Yields good negatives under trying light conditions. Ideal for snapshots at night.



**EXTREME
FINENESS OF GRAIN**

KODAK PANATOMIC-X FILM, in miniature sizes. Enlargements that are many times the original negative size still show no appreciable graininess.

Trapping Fish Pirates from the Air

(Continued from page 196)

is that they will not retrace their course, even to fight free of nets.

These traps, necessarily, are scattered in wide areas. Often a single operator owns a dozen or more. The operators' cannery tenders visit the traps at intervals to load the fish aboard and carry them to the canneries to be marketed. During the interval, the trap often is left with a lone watchman. Among the hundreds of fishermen owning their own boats, but unable to finance traps or procure good locations, there developed the reckless individuals



An Alaska plane pausing at the foot of Taku Glacier

who chose the easy way to grasp a bountiful supply of fish by helping themselves in other people's traps.

These were the pirates, the rustlers of the north, who reaped the silver riches at the constant risk of prison or even death from the bullets of a watchman or an irate trap owner who happened along while the wholesale theft of salmon was in progress. Often the watchmen worked hand in hand with the freebooters. The trap owner, being absent, had no method of measuring the extent of his catch. Corrupted by the offer of the pirate to share in the proceeds of the raid, the unscrupulous watchman allowed and even helped the pirate to load his boat from the trap.

Watchmen who could not be corrupted

often were strongarmed, bound and tossed into a corner of the cabin while the salmon buccaneers helped themselves from the trap. Marketing the fish was so simple that it was not even a problem. Cannery owners had no method of determining the source of the salmon offered for sale, especially since the pirate passed off as a respectable fisherman. The freebooters did considerable legitimate fishing to establish themselves as regulars. A few cannery owners, of course, asked none too many questions, especially if the price was right.

The long series of depredations, extending over a quarter of a century, often had grim aspects as rifles spat bullets from both sides. The old Alaskan was wont to take law enforcement into his own hands in his desperate effort to protect his property.

Today the airplane, first introduced by Capt. Eckmann ten years ago, has made the life of the salmon freebooter unhealthy. It no longer is possible for the buccaneer to slip up to a trap in his boat, corrupt or overpower a watchman and make off with hundreds of dollars in fish because the trap owners employ planes extensively to chart the approach of the salmon and at the same time keep a law-enforcing eye on the traps. The planes speed in a few minutes over a shoreline that formerly took hours to cover in surface boats.

The sight of an unauthorized fishing boat at a trap will cause the plane to drop down out of the sky while the pilot and crew find out just what is going on. And if salmon are being stolen, it is but a matter of an hour or so before the plane will return with authorities empowered to handle the situation.

The pirate's boat cannot travel fast enough to leave the vicinity before the plane returns and once seen from the air, escape is impossible as the pilot can see the marauding vessel, no matter where she flees and hence is able to bring the freebooters to justice.

Names and addresses of manufacturers and dealers in articles described in this magazine will be furnished by our Bureau of Information upon request accompanied by stamped, self-addressed envelope.

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YOU can't beat motorcycling for plenty of excitement and fun. Takes you where thrills come thick and fast. You make lots of new friends — go on club runs and gypsy tours — attend hillclimbs, reliability runs, tourist trophy races — pal with other happy riders. See your Harley-Davidson dealer. Hear the fun-packed story of motorcycle club good times. Take a ride on a snappy new 1939 Harley-Davidson. Get the "feel" of motorcycling—greatest of all outdoor sports. Ask your dealer about his Easy Pay Plans—and send in the coupon NOW!

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Send illustrated literature and FREE copy of "ENTHUSIAST,"
Motorcycling Magazine. Stamp is enclosed for mailing cost.

Name.....

Address.....

Brains Against Flames

(Continued from page 245)

On the fire maps that are constantly being drawn and redrawn at headquarters the first is divided into zones with a zone boss in charge of each. Having 1,000 or more men under him, the zone boss has a staff resembling the one at headquarters for contacting the two or three divisions under his command. Each division breaks down into sectors of from fifty to 100 men with a second boss at the head of each, and each sector in turn is made up of a number of basic crews consisting of ten men each.

This military organization fights the fire while another staff takes care of the camps.



Interior of forest-service "firebox" shows equipment for fighting the flames

Each temporary camp, housing 500 men, has a staff of cooks, clerks, timekeepers, tool tenders, and helpers. The men work twelve-hour shifts and hot food and blankets, canteens of water, electric lights on headbands for working after dark must all be ready when needed. A big power grinder for sharpening shovels and axes and that can be unbolted for carrying on mules in rough country, is set up at each camp. In a distant town, the fire dispatcher of the forest district keeps in touch with the field headquarters and sends extra men and supplies to the scene as they are needed.

Professional forest rangers form the trained skeleton of the fire-fighting army. Each crew leader has to know the country and its possibilities. Before he leads his men into position he has to consider a way

of getting them out safely. Caught in tight quarters near a stream, crews have saved themselves by lying down in the water, gulping the air close to the surface until the flames have passed. Depending upon the type of timber and the breaks in the forest, a crew leader may successfully lead his trapped men on a dash through the flames, escaping over the burned area. This is a desperate, dangerous final resort and many fire fighters, blistered and burned, have saved their lives that way.

Forest-fire fighting is being widely mechanized. Networks of truck trails have been built in many forests so that big water trucks, carrying 250 gallons of water and equipped with one-inch lines for knocking down the flames, can join in the battle. A super-truck carrying 2,400 gallons of water is being tried out for wetting down areas in the path of a fire. Just as valuable as the new trucks are the bulldozers that scrape out new firebreaks and cut out lanes in front of the flames.

Last summer the airplane, in use for years for spotting and scouting fires, came into its own. Thousands of pounds of food and tools were dropped to isolated bands of fighters. In big fires transport planes may be chartered to fly crews into locations that would require days of travel to reach on foot.

The latest ideas in aerial fire fighting are being tried out with an airplane recently bought by the forest service. Equipped with a cargo compartment and with gear for lowering supplies by parachute, the plane is also being rigged with a powerful loud speaker by which orders can be issued to fire fighters on the ground below. Experiments are also progressing with bomb sights and releasing gear for bombing out small spot fires in the mountains with chemical foam. Packages of water, powders, and chemicals are being used as bombs. The experiments suggest that this may become a regular part of forest-fire fighting technique in the future.

Names and addresses of manufacturers and dealers in articles described in this magazine will be furnished by our Bureau of Information upon request accompanied by stamped, self-addressed envelope.

HOW DO YOU LOOK IN YOUR BATHING SUIT?

**SKINNY?
THOUSANDS GAIN
10 TO 25 POUNDS
THIS QUICK EASY WAY**



**Read how thin, tired-out, nervous,
rundown people have gained health
and strength—quick!**

ARE you ashamed to be seen in a bathing suit, because you're too skinny and scrawny-looking? Are you often tired, nervous—unable to eat and sleep properly?

Then here's wonderful news! Thousands of skinny, rundown men and women have gained 10 to 25 pounds, new pep, new popularity—with this scientific vitamin-rich formula, Ironized Yeast.

Why it builds up so quick

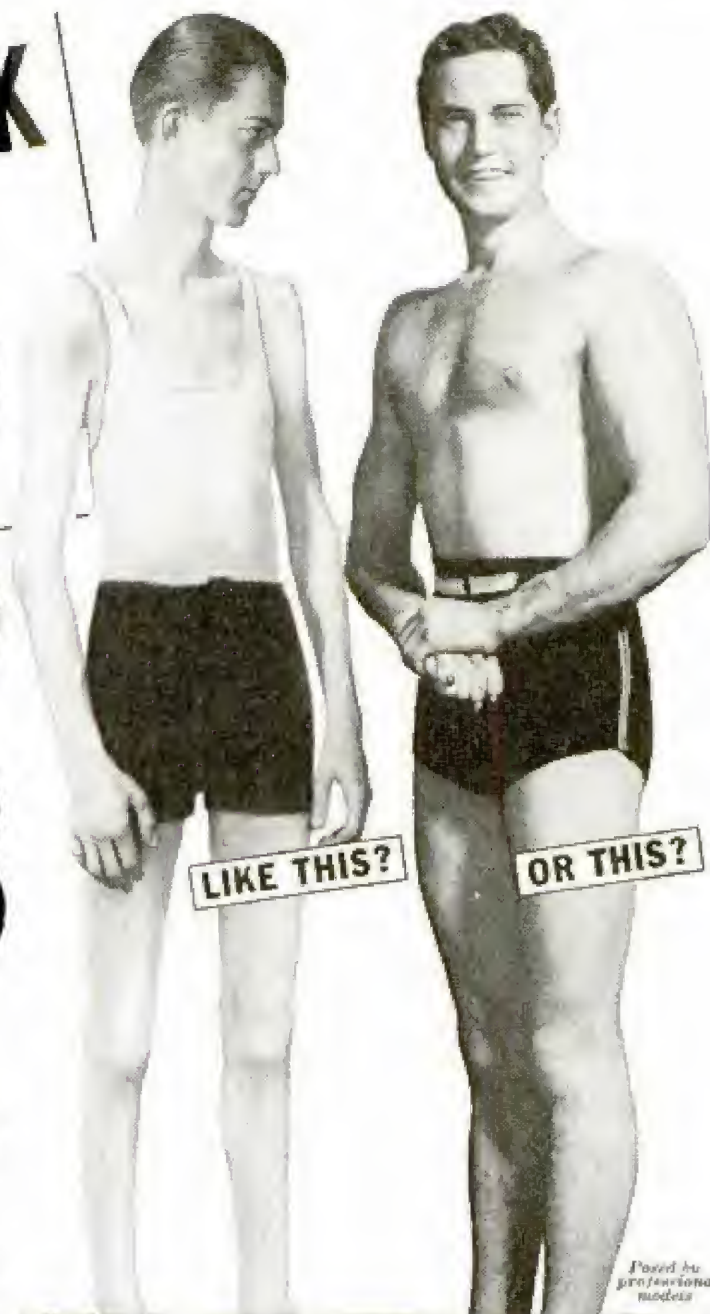
Scientists have discovered that countless people are thin and rundown—tired, cranky, washed-out—only because they don't get enough Vitamin B and iron from their daily food. Without enough of these vital elements you may lack appetite and not get the most body-building good out of what you eat.

Now you get these exact missing elements in these marvelous little Ironized Yeast tablets. No wonder, then, that they have helped thousands of people who needed these elements to gain new naturally attractive pounds, new health and pep, new popularity and success—often in just a few weeks!

Try them without risking a cent

Get Ironized Yeast tablets from your druggist today. If with the first package you don't eat better and FEEL better, with much more strength and pep—if you're not convinced that Ironized Yeast will give you the new pounds, new energy and life you've longed for, the price of this first package promptly refunded.

But just one warning! Due to the success of



*Posed by
professional
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Ironized Yeast, a number of cheap, inferior substitutes have sprung up. Of course inferior substitutes do not give the same results. So insist on genuine Ironized Yeast. Look for the letters IY stamped on each tablet.

Special offer!

To start thousands building up their health right away, we make this special offer. Purchase a package of Ironized Yeast tablets at once, cut out the seal on the box and mail it to us with a clipping of this paragraph. We will send you a fascinating new book on health, "New Facts About Your Body." Remember, results with the first package—or money refunded. At all druggists, Ironized Yeast Co., Inc., Dept. 532, Atlanta, Ga.

TUNE IN ON THE GOOD WILL HOUR, every Sunday Evening. See your local paper for time and station.



Irvin Echard

Gains 14 lbs. in 5 Weeks

"I was so skinny I didn't want to go out. Finally, I tried IRONIZED YEAST. In five weeks I gained 14 lbs. Now I go out regularly, have good times."

Irvin Echard, Barborton, O.



R. Loeffler

Gains 12 lbs., admired now

"Was losing weight and pep. Then I got Ironized Yeast. In 6 weeks I gained 12 lbs. and am full of pep. Everybody admires my physique, too."

Ralph Loeffler, Arlington, Wash.

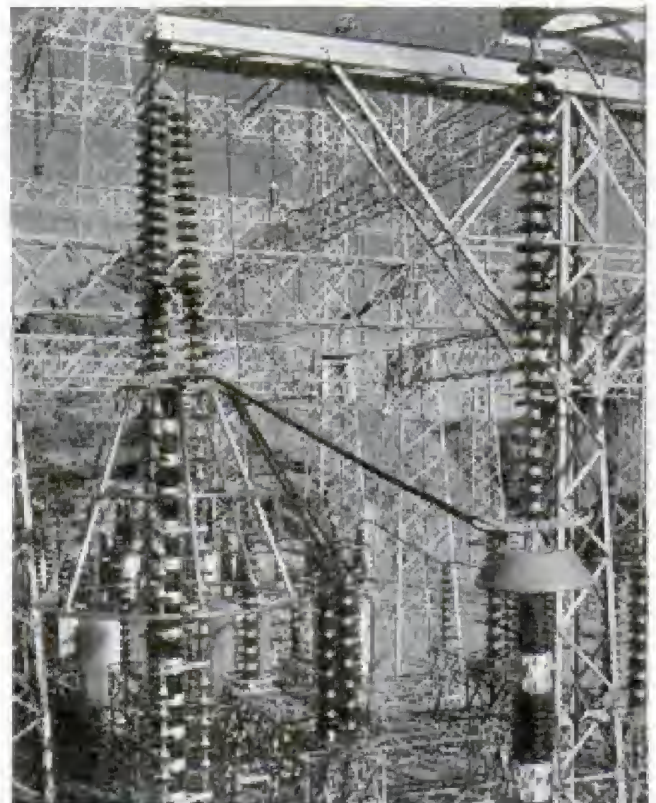
H 1258

Harnessing America's Wildest River

(Continued from page 204)

total of 1,835,000 horsepower, and the electrical energy generated yearly will amount to about 4,330,000,000 kilowatt-hours.

At present four turbines have been installed, their generators supplying power which is transmitted to Los Angeles over one of the most wonderful power lines in the world, since it is virtually automatic in operation throughout its distance of nearly



The "switchyard" at Boulder dam from which power is routed to Los Angeles

300 miles. Circuit breakers operate instantly in case of trouble, shunting the load from a damaged line to an undamaged one.

The power transmission is directed from a main control room where two or three men check an array of dials and instruments. A remote-control board in this room connects with the main power units and the men in this office are in contact with the receiving station in Los Angeles and with the "electrical cowboys" riding herd on the transmission line.

Two high-speed elevators descend 528 feet from the roadway at the crest of the dam to the powerhouse. Power-plant machinery is lowered from the rim of the canyon to the powerhouse by means of an

We use it too, the same as you And almost every day.

To settle upset stomachs, or To chase head-aches away.

I never mind the winter days When I am feelin' prime But, with a cold or stumick ache I jest aint worth a dime. We always like to have a box Of Alka-Seltzer 'round. I wonder if you'd mind to bring A package out from town.

Alkalize with Alka-Seltzer AT ALL DRUGGISTS

Beware - Alkalize

Alka-Seltzer

An Alka-Seltzer

Tablet in a glass of water makes a sparkling pleasant-tasting solution. Drink it and it gives quick relief from Head-aches, Sour Stomach, Distress after meals and other common ailments. It also helps overcome excess acid condition so often associated with these troubles.

DO YOU

in a few weeks earn big income in service fees,—not medical nor chiropody—easy terms for home training, no further capital needed, no goods to buy, no agency. Established 1894. Address

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H1258

electrically operated cableway 1,200 feet long and with a capacity of 150 tons. The cableway can be operated by remote control from any one of five stations.

The dam and powerhouse are operated much like any large industrial plant and office building. More than 800 men are at present employed there but over 500 of them are engaged in construction and maintenance work and in installing additional machinery. Of about 300 others, seventy-five or more are employed in the power generating department reading dials, checking the flow of oil and watching the generators and turbines.

The powerhouse contains more than ten acres of floor space and janitors inside and outside the structure keep it spotlessly clean. There are elevator operators, guides, maintenance men and electricians, pump operators, pipe fitters, a crew of painters constantly at work renewing the paint on the hundreds of miles of pipes and fittings and, last but not least, three rangers to maintain order.

While only a few hundred men actually are employed at the dam, and only a handful of men are needed in the actual control of the water itself, Boulder dam has created jobs for thousands of men and in the future will create work for many others. Below the dam lie some of the world's most forbidding desert areas, lands drier than the Sahara. Without irrigation the areas have been useless. With irrigation, their rich soil and the warm climate make them very productive.

Part of this area of 1,900,000 acres is now irrigated. Eventually the irrigation will be extended greatly and hundreds of people will find homes and rich farmlands where now is arid desert. The All-American canal, extending from the Colorado river near Yuma, Ariz., some 300 miles below the dam, along the international boundary some eighty miles to the west, will give to the great Imperial valley an adequate and reliable water supply, the water coming from the almost limitless store hoarded by Boulder dam.

This dam will also assure cities and towns of southern California a safe and reliable domestic water supply. A \$220,000,000 aqueduct will tap the Colorado river at Parker dam, 150 miles below Boul-

(Continued to page 121A)

YOU'LL FIND Dozens of Uses for this 1/4" Junior Drill



With the same fine quality as the 1/4" Junior, but with greater power and capacity is the 1/2" Junior illustrated at left.

The Black & Decker 1/4" Junior drill has been definitely designed for the man who needs an "all-around" drill—and it's priced so reasonably that you can't afford to be without it. Here is a ruggedly built, powerfully motored, perfectly balanced drill that can be used in any metal or wood, that will drive various accessories, that can be picked up at any time for odd job use, or that can be used in a bench drill stand for more accurate work. And to top it off the 1/4" Junior is chockful of all the traditional quality that has made Black & Decker famous for fine tools. Get full details about this remarkable drill today—and its larger brother—the 1/2" Junior. Sold through leading jobbers. The Black & Decker Mfg. Co., 602 Pennsylvania Ave., Towson, Maryland.

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HOW TO WORK IN Wood



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Our last previous catalog No. 10 was in such demand that we were unable to supply delayed inquiries.—To make sure of getting this latest 1939 edition catalog No. 11, better write at once!

Tired businessmen: get back to this absorbing hobby; it beats golf; you know it does.

Write for this Book

Harold Hunt, President
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I enclose 10¢ (stamps or coin) for which please send new 136-page Catalog No. 11, latest 1939 edition.

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Here is Harold Hunt's remarkable NEW 1939 catalog and guide for woodworkers.

NEW IDEAS FOR THE EXPERT

Page upon page of the latest up-to-date information; new patterns, novel designs, new devices.

Six new pages on wood finishing, the knacks, the little secrets, correct processes of finishing.

Extra facile method of inlaying; even a beginner can do it.

235(!) brand new scroll and fret patterns; choice new designs for trimmings; also new types of hardware. And so on and so on.

A GUIDE FOR THE AMATEUR

Complete, detailed directions—so that the merest beginner can start right in with nothing but a hammer, saw and plane (or with a scroll saw) making beautiful furniture. You should see how absolutely clear everything is made for you in this Catalog:

1) Just what tools you need,

beginning with only the three or four everyday tools probably now in your basement.

2) Just what lumber to buy and in what sizes and exactly what hardware and miscellany for the things you decide to make.

3) Then precise, detailed directions with the pattern you pick.

Bargains, too!

Besides listing ALL the standard American woods and 35 rare imported woods, including the choicest, hard-to-find, fancy woods,

many of these at astoundingly low prices and besides

Showing page upon page of carvings, trimmings, tools and hardware while posting you always on present best prices,

Besides all these thousands of quotations, this catalog contains a series of "deals," some 20 to 25 simply baffling bargains in lumber, veneers, and inlays; for example:

Deal No. 101A—Complete quality scroll saw outfit. . . **\$1.98**

Deal No. 102A—Outfit No. 1 of beginners tools. **\$5.25**

Deal No. 21—3 pieces each, 6 sq. ft. 1½", 1¼" and ¾" (choice of black walnut or mahogany) **\$3.20**

Deal No. 35, 4 pieces, each piece 3 sq. ft., 1¼"; Vermilion (East India) Lacewood (Australia) Benin (West Africa) Black Walnut (America), All 4 pieces, total 12 square feet **\$3.00**

Deal Set No. 4—20 pieces, 2½" x 5" x 1¼" of 20 different kinds of American woods, each piece labeled. In neat box. Invaluable for reference. All 20 at the nominal price of only **\$1.00**

Deal No. 14—100 sq. ft. Craftsman Special Veneer A grade, 1/28, size about 12" x 36", 7 kinds. Superbly beautiful, marvelous bargain. For detailed description see catalog. **\$6.25**

Deal Set No. 3—25 superb imported woods—2½" x 5" x 1¼" all labeled, in neat box. All 25 for. . . **\$3.50**

Deal No. 109A—Rare fancy woods for marquetry and inlaying; 5 sq. ft., maximum length 35". **\$4.50**

Choice of 1) British Guiana purple Amaranth, or 2) West African light brown Iroko, or 3) Australian silky brown Lacewood, or 4) East and West Indies light yellow striped Satinwood.

Several "deals" on inlays, overlays, and trimmings; also various special hardware bargains. To get the right idea of all these values you must see the new 1939 catalog No. 11.

All prices are F. O. B. Chicago.

Remember! Everything we list in our catalog we keep in our stock. We ship the day we get your order. Mail coupon.

For additional bargain (and for right prices on every kind of woodworkers supplies) read 1939 catalog.—See coupon at left.

When writing to advertisers please mention Popular Mechanics

(Continued from page 119A)

der dam, and will carry the precious water 250 miles across the desert, through tunnels and over mountains to the coast cities.

While the dam has made of the Colorado river a friend instead of a menace to the people of the southwest, it has also opened up a great new recreational area to the people of all the country, an area established for the purpose by the government because in many ways it is expected to rival the most popular national park as an attraction for tourists and sportsmen.

Lake Mead, the desert sea, provides easy access now to stretches of the Colorado river which had been visited by only a few daring expeditions before the dam was built. The lake now extends for some thirty-nine miles up into the Grand Canyon and opens amazing vistas of colorful and impressive cliffs rising overhead nearly a mile at some points along the lake.

The lake and dam have already become popular with vacationists and are visited by nearly 500,000 each year. The lake was stocked with fish, then it was found to be teeming with large-mouthed black bass which are present by the thousands and have come from no one knows where. At any rate, this lake in a desert has become known as a fisherman's paradise.

Thus harnessing America's wildest river has done more than prevent devastating floods and equally devastating periods of drouth. The Colorado today not only is no longer a flood menace; it supplies a reliable source of water for domestic and irrigation purposes 250 miles distant, it produces a steady flow of electric power for the southwest and it has transformed a barren, arid, inaccessible area of this country into a new American playground.

Plenty of Red on Your Bait Will Catch More Fish

When you prepare to go fishing, put plenty of red on your bait. Fish have a yen for red, with green the second choice. In recent tests at Northwestern University, bass in white electrically wired basins were fed by medicine droppers tinted in various colors. Each fish had a certain color dropper, and if the wrong color was approached the fish received an electric shock. Gradually each fish learned its particular training color, red being most popular.

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Where can I get plans for making things?

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Where can I learn about fine cabinet woods and veneers and can they be bought in small quantities?

Where can I get helpful hints on finishing my projects?

How do I go about joining a home workshop club? Etc., etc., etc.

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10c to 65c at your Hardware, Paint or Lumber Dealer's.

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**FASTER
FINER, EASIER
WORK with the
All-Purpose
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FUN OR PROFIT

for home craftsmen, model builders or professional artisans.

No other electric, motor-in-hand tool gives you all the advantages of the MOTO-TOOL. 25-27,000 R.P.M. and easily handled. Its lightness, perfect balance and convenient shape, gives you delicate precision control, yet does heavier work in amazingly quick time.

A variety of accessories available with the MOTO-TOOL makes you master of many jobs—cutting, carving, sawing, grinding, drilling, engraving, routing, sanding, shaping—any material. Thousands in use. These sturdy MOTO-TOOLS are built for long, trouble-free service. Has Bakelite, shock-proof housing. Integral finger grip close to chuck . . . self-releasing chuck lock . . . convenient snap switch and other exclusive features. Plugs into any A. C. or D. C. socket. At your dealers or direct by mail. **FREE booklet** on request.



Model 1, with one 1/8 inch Collet . . . \$9.85
Model 2, with one 1/8 in. Collet . . . \$16.50

MODERN CRAFTSMAN'S KITS
In handsome hardwood cases
for light work. Model 1, with 23 accessories . . . \$17.50
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30¢ BUYS CLASS & CLUB PIN!
SMART, up-to-the-minute designs. Pins in 2 colors with any 3 or 4 letters and year. Handsome Sterling silver rings. Oldest, largest makers famous for quality for 44 years. Clean cut work distinguishes Bastian Pins and Rings anywhere. Write for new catalog today!
BASTIAN BROS. CO.
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WITH QUIK-TRIK RUST REMOVER
Save Your Tools and Metal Parts from Destruction—Remove Stains from Tile and Porcelain.
So quick, so easy, so complete that you'll tell your friends. Money back if it's not the best you've ever used. Send 50 cents in stamps or coins.
Big 1/2 pound Jar
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BEATS
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on BOATS**

**Only Boats With
Full Length Spray Rails**

Keep passengers perfectly dry—even at high speeds. Catalog also shows today's five most popular models of sailboats. Two big factories. Prompt shipment.

CATALOG FREE
Write for your copy. State kind of boat in which you are interested.

THOMPSON BROS. BOAT MFG. CO. (87)
213 Ann St. PESHTIGO, WIS. (Write to either place) 113 Elm St. CORTLAND, N. Y.

**Better Built
Lower Prices**

Canoes \$64 and up

Rowboats \$42 and up

Outboards \$42 and up

Very fast utility model

Human Moles Battle a Mountain

(Continued from page 229)

ature, sixty-eight degrees. All the tunnel workers wear hard hats to protect their heads from falling rock. In addition, men working in the wet sections are clad in rubber hip boots and firemen's rubber coats, the finest that money could buy, yet constantly being replaced because of contact with sharp rock and pouring water.

Powerful little storage-battery locomotives rumble past on narrow-gauge tracks. These little electric engines cost \$6,000 each, of which \$3,000 is the cost of the battery. Some locomotives use a combination of battery and electric trolley. Each hauls from five to ten loaded cars, with four square yards of rock in each car. The rock



Engineer marking contour of tunnel as guide to drillers in preparing blast holes

is carried from the tunnel headings to the elevator or "skip" and lifted to the surface.

The bore is horseshoe-shaped, with the open end of the horseshoe for the floor. Sixteen feet in diameter, it could accommodate a standard-size American railroad train. The bore is built in this shape, engineers tell you, because it is more practical, from a construction standpoint, than a cylindrical tunnel, through which water might pass with less friction. Sides of the tunnel are coated with a special water-resisting concrete twelve inches thick.

Leaving the "tailor-made" part of the tunnel, Superintendent Leadbetter and his visitor plunge into a rocky hole where the scars of battle are still visible on the naked granite. This is what engineers call "good rock," because it stands without bracing. Next comes an area that is heavily timbered, with walls and roof support-

(Continued to page 124A)

"HEAP BIG NEW BOAT READY!"

HOLD 'UM 4 BIG PALEFACES! CARRY HIM ON SHOULDER! USE 'UM BANG/BANG! MOTOR UP TO 9 PONY-POWER! OARS & SAIL!

—Chief Eaglebeak



OARS and OARLOCKS GIVEN—if you hurry!



OK-4 is ideal for Sportsmen! Light, long, strong and roomy!



Even with 4 passengers, a light weight motor gives plenty of power!



Here's OK-4 speeding along with a 4 horsepower motor.



The new 60 lb. OK-4 easily lifted to car-top. Portable!



Two girls easily launch this new-arrived 14 footer!

The Biggest, Lightest and Strongest Boat of Its Kind!

BIG MONEY ASSEMBLING NEW OK-4!
IN A FEW EVENINGS AT HOME!

Everybody—even grumpy old Chief Eaglebeak—is mighty excited over Mead's big, new 14-foot portable Outboard KI-YAK! Think of it! ANYONE, without previous experience, can build OK-4 at home in a few evenings and save nearly HALF the factory-built cost—or sell to others at Big Profit! And get these startling OK-4 features: Carries 4 adults comfortably, and duffle—takes motors 9 h.p. or less, oars and sail—weighs only about 69 pounds for easy portability on shoulder or car-top for fishing, camping, touring, hunting, seaworthy, leakproof, Durable, Double canvas bottom for double-safety! The biggest, lightest, strongest boat of its kind—AND—made only by MEAD—in knock-down kits for quick home-assembly, or factory-built, ready for the water. Rush time for Chief Eaglebeak's Circular, amazing Low Introductory Factory Prices! Oars and oarlocks GIVEN with your OK-4—if you hurry!



4 OTHER GREAT KI-YAKS

A Mead for every need! Paddle-and-sail models: The baby "CK-1", 10 footer, 20 pounder! The Sportsman's 30 lb. CK-2! The "Big bad CK-3" with 90 square feet of sail on 45 pounds of boat—the sailor's delight! Then there's the 50 pound "OK-2"—Sifters Of The Fleet—takes up to 4 1/2 h.p. motor, oars, sail! and REMEMBER—Mead is America's largest Ki-Yak manufacturer—so buy your Ki-Yak from HEADQUARTERS. Rush Coupon and time now!

\$6 PADDLE GIVEN
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5 1/2 Year Old Carries CK-1

← CK-3

CK-2 →



The 50 Lb. OK-2—Uses Oars, Motor, Sail Rig.

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Rush 'um new KI-YAK Boat Circular! Me much interested in heap low Factory Prices. Send 'um details on Free Oars and Paddle Offers. Enclose 10c postage, packing charge! (Please PRINT plainly.)

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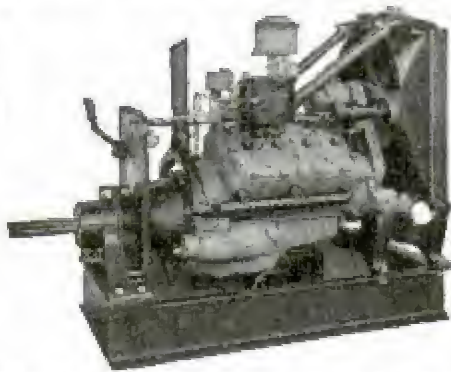
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CAN YOU BEAT THESE POWER COSTS?

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\$293⁸⁰
Per
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with a KRW FORD V8 Unit

50 H. P. with KRW V8 Unit using natural gas (1125 BTU)
@ 30c per 1000 cu. ft. \$ 46.80 per month
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(no tax) \$140.40 per month

Above figures show primary fuel costs (lubricating oil not included) for operating a KRW V8 Unit to develop 50 H. P. for 10 hours per day—26 days per month. Compare this with electricity @ 3c per KWH which amounts to \$340.60 per month. You can pay for a KRW Unit in a few short weeks out of actual savings!

KRW V8 Units are daily saving money for operators of air conditioning and refrigeration equipment, mills, factories, shops, welders, compressors, pumps, well-drilling outfits, contractors' equipment, etc. New KRW "GUARDIAN" automatically stops engine in case of cooling or lubrication failure.

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HOLD-E-ZEE AUTOMATIC GRIP SCREWDRIVERS

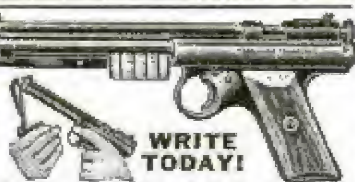
Hold, start and set-up screws in unhandy places. Gripper instantly released by spring action, sliding up out of way when not in use. Finest materials throughout, chrome manganese blades; maps have transparent insulating, unbreakable handles. (Illustrated.)



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NEW BENJAMIN AIR PISTOLS WITH MULTIPLE LEVER HAND PUMP FOR TARGET-SMALL GAME-CAMPING-ETC.

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55 Dickerson St., Newark, N. J.



APPLIANCES

MOTORS

FUSES

(Continued from page 122A)

ed by sixteen-by-sixteen Douglas fir logs. So tightly jammed together are the supports that the rock and sand above can hardly be seen. Here is the "heavy ground" where the granite has been crushed and faulted.

"This crushed rock is man-killer stuff," the superintendent tells you. "Even when we've timbered as heavily as possible, the sand sometimes lets go. Just "whoosh" before you know what's happening. One day about six months ago it came down. No warning at all. One of the boys got caught in it, but we were lucky enough to drag him out alive."

Leadbetter explains that the wet areas also are faulted and that water runs through the cracks. In one section the water came through so heavily that the drillers could make only nine feet progress in ninety days.

"In high-pressure water—which will knock a 200-pound man flat on his back—four to eight men may be required to handle a drill," the engineer says. "Holes at the bottom of the face must be drilled under water. Sticks of dynamite are strapped to poles and the poles wedged into drill holes so the powder will stay in place long enough to be fired."

Last spring a veritable torrent of water was encountered when it reached a peak of 15,800 gallons per minute. But then, as if "old man mountain" had found that this would not stop the drilling crews, the heading advanced almost immediately into a dry section. So abrupt was this change that the front of the drill jumbo was completely dry, while the rear end was being doused with about 10,000 gallons of water a minute.

To remove this water, batteries of giant pumps were installed in the tunnel. Large, bottle-shaped chambers were cut in the solid rock adjacent to the shaft. These chambers could be closed off with heavy steel bulkheads. Pumps with a capacity of as high as 29,600 gallons per minute were installed. These fed huge steel pipes that carried the water through the tunnel and out the portals.

The electric train on which you ride with the superintendent jolts to a stop. Up front can be seen the end of the shaft which the hard-rockers call the heading.

(Continued to page 126A)

\$200 My First Week



... Now in
my OWN
Business.

Would you, too, like to own a business where you could take in \$200 your first week as did L. A. Eagles in Madison, Wisconsin?

We want a reputable, honest man in each county. This man need not have any special experience or more than ordinary ability, but he must be honest and courteous.

Such a man we will start in business for himself. You can make far above average profits in the rug-washing business—a high-grade business all your own. Many earn \$125 to \$200 per week—some considerably more.

NO SHOP NECESSARY

The rug-washer finishes rugs like new on the customer's floor. Anyone can run it. Electricity does the work. A quick, thorough and highly-efficient method that restores the natural beauty of floor coverings.

There are hundreds of customers—in your vicinity and nearby towns. The business grows steadily. Simply wash a few rugs or carpets. These customers tell others and also give you their future work. Soon you will have a prosperous year-around business. Send coupon for booklet explaining everything.

"Profits Pay for Home"

Harry Hill built and paid for a home from rug-washer profits. His first day's business was \$86. Another man writes, "Made \$70 in 13 hours." A. L. Miller says, "Have had rug-washer 6 years—have earned as high as \$92 a day." M. O. Malinin earned 3 times the cost of his machine the first two months. You, too, can enjoy a large income.

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Free Book!
MAIL COUPON now

VON SCHRADER MFG. CO.
102 PL., Racine, Wis.

Send at once (no obligation) your free booklet illustrating rug-washer and telling how I can own my own permanent business; how I can earn large profits at prices below other methods; how I can become financially independent in a short time; and how I can pay on easy terms.

Name

Address

City State

"Never a Complaint"

C. J. White says: "\$100 business in six days—never a complaint." That is the nicest part of this business—every customer is more than satisfied. Stains and blotches disappear and vivid colorings and freshness in faded floor coverings come back.

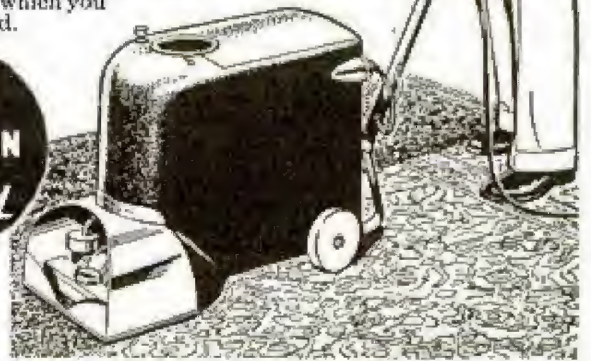
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A low priced quality power sprayer that will spray lacquers, enamels, varnishes, dyes, cold water paints to any surface. It is compact, portable, simple to operate, built to stand hard use and economical to use. Complete unit is equipped with 3 cubic foot piston type compressor, latest type pressure feed spray gun with fan and round caps, 15 feet hose, air gauge, 1/2 H.P., 110V, 60 cycle A.C. motor. Send \$3.00 with order business express C.O.D. Specify No. 120A. A 5 cent stamp will bring you No. 9 catalogue listing this and 600 other items.

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New 24" LATHE \$490
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A heavy duty, smooth running wood lathe at a remarkable price. 32" long, 7" high. Turns pieces 4 1/2" in diameter by 24". Fully adjustable, 2-speed. Weighs 10 lbs. Long and short tool rests, OILLESS bushings. Satisfaction guaranteed or money back.

Free Catalog describing \$150 price content (1st prize, \$25; 2nd, \$15; 3rd, \$10; all other cash and merchandise prizes). Cat. illustr. complete power tool line: Jig Saw, \$1.50; Shaper, Circular Saw with oilless bearings, \$3 each; Drill Press, \$2.50; 9 1/2" Lathe, \$2; Sander, \$1 etc. Order today or send card for Catalog.

J & H Metal Products Co. 5 Commercial St. Rochester, N. Y.

(Continued from page 124A)

The jumbo—a monster of a machine on which the drillers operate—looms ahead.

Leadbetter explains that the process of excavating a tunnel with modern engineering skill consists of three mechanical steps repeated over and over again—drilling, blasting, and mucking. On the jumbo are located the two-man crews with their powerful compressed-air drills.

In "good rock," when the tunnel was being driven "full face," as many as eleven drills sometimes were operating simultaneously. From twenty to sixty holes were drilled before being filled with dynamite. There was keen competition among the drillers to see which crew could get its quota of holes drilled first. When all eleven drills started chattering at the same time—each making more noise than a machine gun—you ceased to hear the ear-splitting racket. You felt it shuddering up and down your spine.

The second step, following the drilling, was loading and blasting. The holes had been drilled from eight to ten feet in length and three inches wide. These were carefully loaded with dynamite and black powder. When the holes were fully loaded, the hard-rockers withdrew 2,000 feet as required by safety regulations. An electric spark set off the blast.

The third step was "mucking" or clearing away the broken rock fragments shattered by the force of the explosion. With long iron bars, the miners pried loose slabs of rock clinging to roofs and wall. Then the mucking machine went to work. This is a \$10,000, electrically driven monster that scoops up huge loads of rock, lets it slide down its throat onto a moving belt, and dumps it into a waiting car.

Down in the tunnel were complete shops for keeping the pumps, the locomotives, the drills, and the electrical equipment in good repair. Drill steel must be sharpened after each drilling operation, and the "drill doctor" had an endless job. In addition to the repairmen, a regular first-aid crew stood ready at all times to put adhesive tape on a scratched finger or to resuscitate a man overcome by suffocation.

Men working on the tunnel were paid good wages. For example: a "gandy dancer" or track workman earned \$6 a day; a driller's helper received \$7.50; a driller \$8; and the operator of a mucking machine \$10.

Fighting Noise with Light

(Continued from page 167)

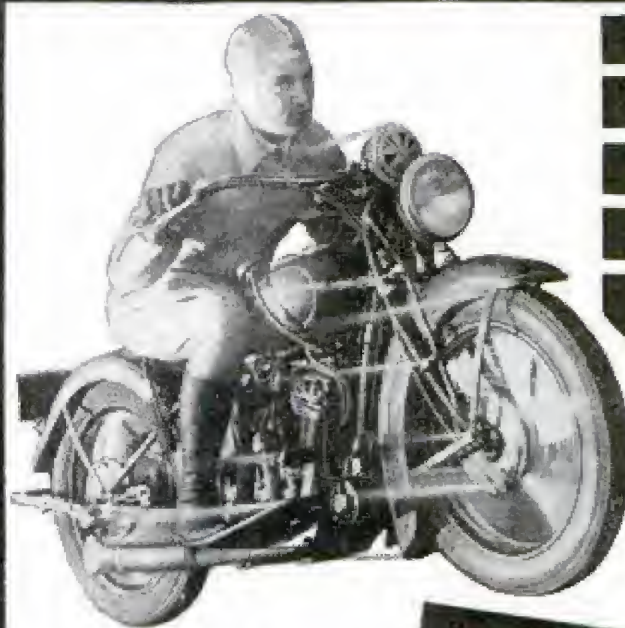
the test strip, engineers have minimized the effect of temperature changes by absorbing heat before it reaches the steel. The earth's magnetic force and other strong magnetic fields are neutralized by a special coil and the application of three additional metal strips to form a complete magnetic circuit.

The measuring machine consists principally of a tiny roller, about the size of a darning needle, on the end of which is fastened a mirror about half the size of a dime. A divided photoelectrical cell and a light beam complete the setup. When a test strip is placed on the roller and magnetized by direct current, it lengthens. The light beam focused on the mirror is reflected to the photocell, registering the amount that the roller turns, determining the elongation of the strip. As the light beam moves, one part of the photocell gradually records more light than the other, tracing the deflection of the light beam, which may be as small as four ten-thousandths of an inch at a distance of about thirty-nine inches from the source of the light beam. By actuating a galvanometer, which measures a small electric current by movements of a magnetic needle, the photo-cell magnifies this deflection 100 times, making it readable.

Another machine developed for the battle against noise is the dynetric balancing device, an electrical brain designed to take vibrations out of rotors, the whirling parts of motors and generators. This machine feels and sees the rotor unbalance, which is sometimes as heavy as fifteen pounds in large machines or as minute as a drop of water in small motors, such as those used in vacuum cleaners. The balancer makes rapid-fire calculations which save hours of search for the cause of off-center weight.

Electric networks, magnetic currents and light from a Stroboglow provide the brain of the machine. The magnets and electric circuit "pick up" vibrations as slight as two one-hundred thousandths of an inch, and translate them into electric currents. Relayed to an amplifier, these vibration messages are analyzed and the "brain" calculates where the rotor is unbalanced and prescribes the amount of weight required to restore its balance.

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A mighty motorcycle at a midget price to bring you sport, adventure, fun! Junior Scout's easy handling, flashy getaway, zooming power and economy of operation make it America's greatest motorcycle "buy." With three other famous Indian models, refined and improved for 1939. Your Indian dealer has a pay-as-you-ride plan. See him today!

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Please send me items checked [] Indian News for one year (I enclose 15c in stamps to cover mailing cost). [] Certificate of Value entitling me to Indian Sport Jersey FREE when I order my new Indian motorcycle. [] Indian catalog.

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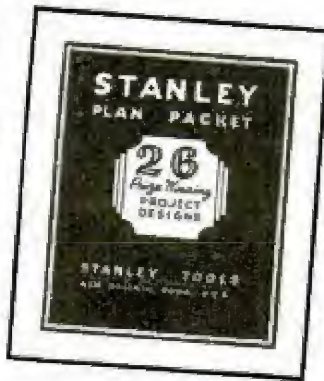
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Please be sure to check your age group
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26 prize-winning plans for every man who enjoys working with tools and wood! You'll want to make every project, whether your shop is large or small. Important feature—each drawing is on a separate 8½ x 11" sheet of tough paper. Write today for the Stanley Plan Packet; only 50¢ postpaid anywhere in the U. S.

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Costs only 1/5 of a cent per mile. From 100 to 120 Miles per Gal. of gasoline. A powerful, high grade machine, with Sachs Motor, chain drive, 2-speeds and clutch, powerful brakes, balloon tires. SPEEDS UP TO 40 MILES per Hour. Big compartment for packages. Needed by everyone in etc., WRITE for special offer today.



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The Wonders of Astronomy

(Continued from Colorado Section)

Thirty horsepower does the work as the truck tires tread against the inner wall of the dome. Huge springs keep the tires in contact with the dome under 85,000 pounds pressure and each motor and truck tire is mounted on rubber vibration absorbers. The system operates so smoothly that it is impossible to tell when the motors are running. Arc welding instead of riveting was used throughout the construction of the telescope and dome.

Insulating the big mirror against changing temperatures is extremely important because the slightest change in shape of the concave surface might destroy its effectiveness. The dome really consists of two domes, one supported inside the outer shell with a four-foot insulating air space between. The exterior is to be painted aluminum to reflect the sun's rays and the inner dome is also sheathed with a protective aluminum coat. It is estimated that the temperature rise inside the dome on the hottest days will never be more than five degrees. When not in use the 200-inch mirror at the base of the telescope will be protected by thermally insulated overlapping metal sheets hinged to fold over the glass like flower petals. A special motor is used for swinging them open.

To find out ahead of time how their sky giant would work and to correct any possible errors in engineering, the scientists built a scale model of the instrument and mounted it, complete to electric drives and an insulated dome, on the roof of the astro-physics building on the Pasadena campus of the institute. One-tenth actual size, the model has a 20-inch mirror and is an efficient, useful telescope.

With the use of the big telescope still a year away the Palomar observatory is already making history because the world's largest Schmidt telescope, a special photographic exploring instrument using a twenty-four-inch mirror and an eighteen-inch aperture, is now in use there. With this instrument one of the most puzzling phenomena in the universe is receiving close study in cooperation with the big telescopes of the Mount Wilson observatory of the Carnegie Institute. The astronomers are studying the super novae, stars of ordinary or minor brilliance that suddenly

burst into tremendous luminosity for no apparent reason. One of these stars may rise from almost invisibility to a brilliance equaling 100,000,000 times the brilliancy of our sun, although, of course, such super novae are so far away that the estimates can be made only with telescopes. The explosion may require a month to reach its peak, after which the star that has suddenly gone wild begins to fade again.

In studying the super novae the astronomers are right on the brink of the unknown because the spectra of these bursting stars are unlike the spectra of any other known objects. Apparently the elements in these stars are in such a chaotic physical state that they can't be recognized or compared to the elements we know. Instead of the thin spectral lines by which the elements in stars can be recognized the lines of the super novae resemble broad bands.

Study of the remarkable character of the spectrum and of the sudden luminosity and tremendous release of energy found in a super nova, it is thought, may lead to much new knowledge. But today practically everything about them is a mystery.

In any system such as the galaxy of which the sun is a member, a super nova may occur only once in from 600 to 1,000 years. The importance of the Schmidt telescope lies in its ability to search out such exploding stars as they occur, so that other instruments may be trained on them for close study. The present Schmidt telescope is being duplicated in an even larger instrument, with a seventy-two-inch mirror, on Palomar mountain.

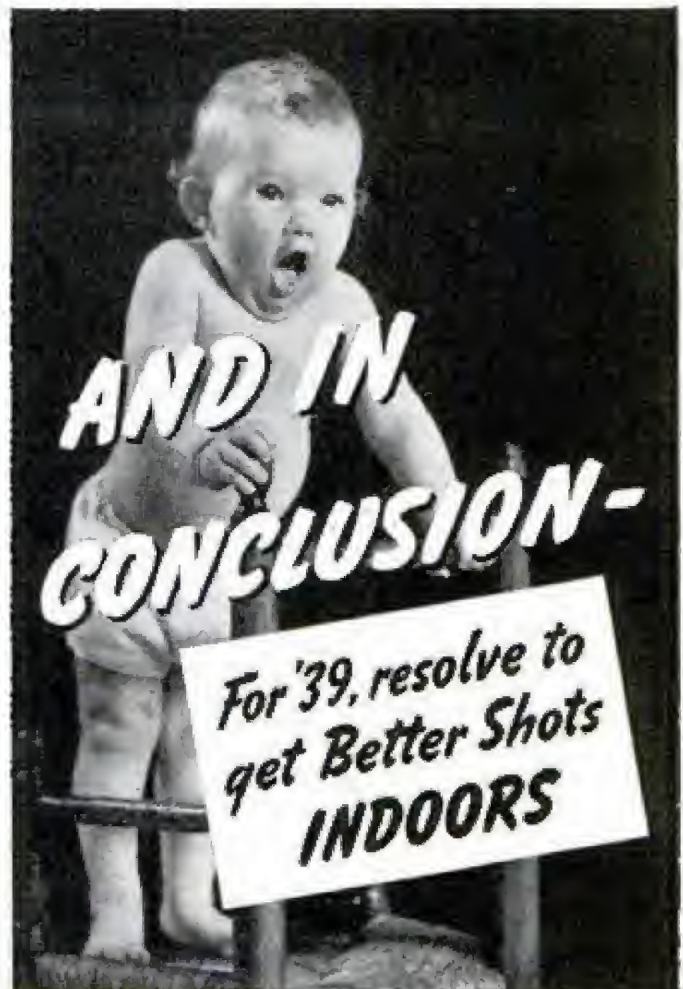
Check and Double-Check

(Continued from page 213)

fuel consumption under varying conditions, vibrations in single parts of the ship and in groups of parts, load distributions, air-flow characteristics over the airplane in different attitudes, speeds and operating conditions, and scores of other equally important matters are checked with an accuracy never before possible in actual flight.

Among the instruments carried for recording test data are an air-speed trailing bomb, potentiometer for recording temperatures, differential pressure gauges, hydraulic pressure gauges, accelerometers,

(Continued to page 130A)



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GENERAL ELECTRIC
MAZDA PHOTO LAMPS

(Continued from page 129A)

PLAY RECORDSthrough your
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NEW MYSTERY
RECORD PLAYER****NEEDS NO CONNECTIONS!**

Now—listen to your favorite recordings where and when you choose! Lafayette's amazing new **Mystery Record Player** operates through any radio (regardless of age, make or type). No wires to attach. Simply plug into 110-volt a.c. outlet anywhere in the house. Has Hi-Fidelity Crystal Pick-up, plays 10" or 12" records. Connection for toy "mike". Your radio controls tone and volume. Portable walnut finished case. Lafayette's new thrill sensation is a **\$14.75** gift at only

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A screwdriver is the only tool needed. 1/5 H.P.
Average assembly time 30 minutes.

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propeller stress-measuring apparatus, photographic equipment for recording flying characteristics, and boundary layer and wake measuring instruments.

A pitot static tube on an airplane is used normally to measure air speed, and the air-speed trailing bomb is simply a ballasted and finned pitot static tube on the end of a long cable. By trailing the bomb in a region unaffected by the airplane and its wake, the total and static pressures at the pitot on the bomb may be compared with the pressures from the pitot static tube on the ship.

Until recently the actual power developed by an airplane engine in flight was unknown although an approximation was made by extending the test stand performance of an engine to altitude by theoretical means. On the "DC-4" we have a device which indicates the actual crankshaft torque developed by any of the four engines at any time. The external stationary gear of the planetary gear reduction is balanced by means of hydraulic pressure within two cylinders. This hydraulic pressure is easily recorded in flight and is translated into actual engine torque. This, with the tachometer which gives engine speed, yields an accurate measurement of brake-horsepower developed.

Potentiometers measure the temperature of every cylinder, oil temperatures throughout the entire oil system, the temperatures of various accessories and of two thirty-horsepower auxiliary power plants, and brake-drum temperatures during taxiing and landings. A survey of the pressure distribution of the fuselage is also being made to determine the best design for the sealed cabin. Long rubber tubes to various points, a bank of typewriter-like selector valves and a differential pressure gauge are used for this purpose and enable an operator to take readings as rapidly as he can press the buttons.

Propeller blades are exposed to centrifugal and thrust loads and also to engine-torque impulse loads and vibrational loads. Because of their fatiguing effect, the last two are very important and the magnitudes of these loads are measured at several points on the propeller blades with the aid of carbon elements cemented to the blades, the resistance of which varies with the deformation. By means of wires run

along the blades to brushes and from rings on the nose case of the engine to an oscillograph, a photographic recording of stress variations is obtained.

A movie camera also makes a record of the force applied on all the controls and the direction, the movement of the controls in degrees, the accelerations of the plane and the attitude of the plane in every dimension. The camera is trained on a set of normal flight instruments, including turn-and-bank indicator, artificial horizon, directional gyro and air-speed indicator to record the attitude and flight condition. At the same time the camera makes a record of the readings of separate instruments which indicate the force applied to the controls and the movement of these controls. There are instruments on this ship which measure the energy lost when forcing the wing through the viscous medium, air, and there are others which show the force the pilot applies to the elevator control which is equipped with a hydraulic booster. There is even a carbon-monoxide indicator and a complete system for oxygen distribution to members of the test crew, since the cabin is not yet pressurized.

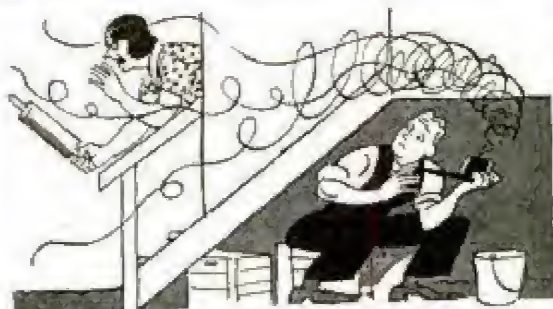
All this may seem a bit complicated—and it is. It's so complicated that it may take twenty engineers and observers to glean all the information which all these test instruments deliver on a single flight. If I so much as bat an eye in the cockpit, an instrument somewhere on the ship will record the fact for posterity—and probably measure the energy I required to do it.

After a few months at the controls of the "DC-4," I no longer need speculate on my flying skill. It has been analyzed for me by scores of sensitive instruments which faithfully record everything I do and every move I make from the time I climb into the cockpit in the morning until I climb out at night.

The real "miracle men" of aviation today are not the test crews who, with the aid of a truckload of instruments, test the performance of a new plane after it is built. The wonder boys are the fellows who doped out all the performance characteristics before the ship was built. These wizards of the slide rule and power curve set down the performance specifications for the "DC-4" some three years ago while the raw materials for the plane were still

(Continued to page 132A)

HERE'S WHY MARIA WAS MAD AT HIS BRIAR!



HAVE A HEART on your husband, ma'am—don't bawl him out for smoking. After all, it isn't his *pipe* that smells bad, it's that hot-and-heavy *tobacco* he always buys.



NO MORE FIGHTS. Some friend switched him to Sir Walter—two ounces of cool-smokin' burley—so mild it *never* bites the tongue—and a wife-winner for *aroma*!

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AS IT SMELLS**



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**AIR-COOLED WONDER PEN****\$2.00****Setting Bugs to Catch Bugs**

(Continued from page 253)

The Bedalia beetle is also bred and shipped to the Gulf Coast states. Growers and nurserymen there find it effective against the cottony-cushion scale that infests citrus trees and ornamental shrubs.

Orders are filled for many other kinds of insects. Commercial insecticide companies sometimes want ordinary clothes moths for experimental purposes. Taxidermists often request buffalo carpet beetles to use in cleaning skins. Professional fumigators place buffalo carpet beetles in capsules which are then spotted at various places in a house to be fumigated. After their work is done, the fumigators display the capsules containing dead beetles as proof that their work has been effective.

Another phase of Dr. Morrill's work lies in supplying high schools and colleges with biological and botanical specimens. He has more than 20,000 tropical butterflies, one of the largest collections in the world.

The methods of breeding and raising insect parasites are patterned somewhat after the technique developed by Dr. Stanley E. Flanders of the University of California. Dr. Morrill, however, has added his own inventions and variations. Much of his work is done in co-operation with the United States Department of Agriculture and various universities.

Breeding millions of insects each year calls for a large and constant food supply. Dr. Morrill has discovered that the eggs of the grain moth provide a tasty diet for most parasitic insects. These eggs are only about one-fortieth of an inch in length and are shaped like rice kernels.

The grain moths are housed in a special room where temperature, light, and humidity are regulated. They are confined within cloth sacks and the eggs are collected in glass jars at the bottom of each sack. Once a day these jars are removed, and the eggs are collected and cleaned. Some of these eggs are used as Trichogramma egg depositories, and some as food for the wasps. They may also be used as food for the Cryptolaemus beetles during shipping. These eggs also make excellent food for tropical fish.

When the eggs have been collected and sifted, they are glued to small cards. In this manner they can be handled easily and counted quickly. A sheet of paper meas-

14 12 38

uring six by eight inches is coated with sixty-four small squares of library paste. The eggs are sprinkled over the paper and cling to the sticky squares. Each square holds about 1,000 eggs and the whole sheet about 64,000 eggs.

These egg cards are exposed to the female *Trichogramma* wasps which deposit eight or ten of their own eggs inside each egg of the grain moth. In about eight days, the adult wasps appear. To arrest development, the egg cards are sometimes kept in a refrigerator. Low temperatures produce a state of suspended animation, and the larvae may remain in "cold storage" for as long as six months.

The method of raising ladybird beetles is somewhat different. Potatoes are allowed to sprout in a darkened room. The sprouts are then thoroughly infested with mealy bugs. Adult ladybird beetles lay their eggs on the potato sprouts and as the larvae mature they eat the mealy bugs. It takes about a month for them to appear as full-grown beetles.

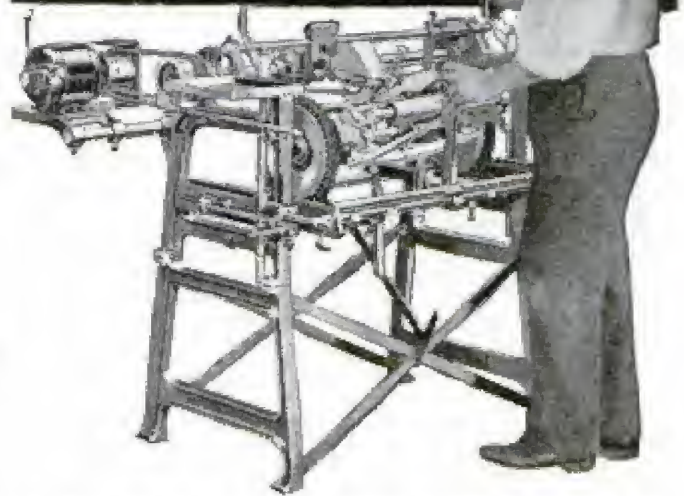
Dr. Morrill has developed several ways of shipping his insects. The egg cards containing the wasp larvae are cut into smaller strips and squares and packed in paper cups. As many as 50,000 potential *Trichogramma* may be shipped this way. Smaller amounts are sealed in gelatine capsules. Loose eggs for tropical fish food are usually packed in half-dram vials. Ladybird beetles are shipped in small cardboard boxes which have a wire-mesh screen on one side for ventilation.

The time element in shipping is important. Eggs containing wasp parasites must reach their destination before they hatch. When a shipment of wasp parasites is received by a farmer, a small hole is cut in the container and it is pinned in a tree. In a peach orchard, about 1,000 wasps are freed six weeks before the fruit is harvested. In citrus orchards, about 100 ladybird beetles per tree are released. Each beetle will destroy about 100 mealy bugs.

Biological control of insect pests is only one phase of America's war on insects. In recent years, however, the use of speedy air transportation has made it more effective than ever before.

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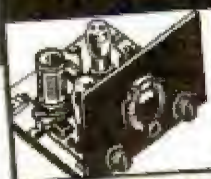
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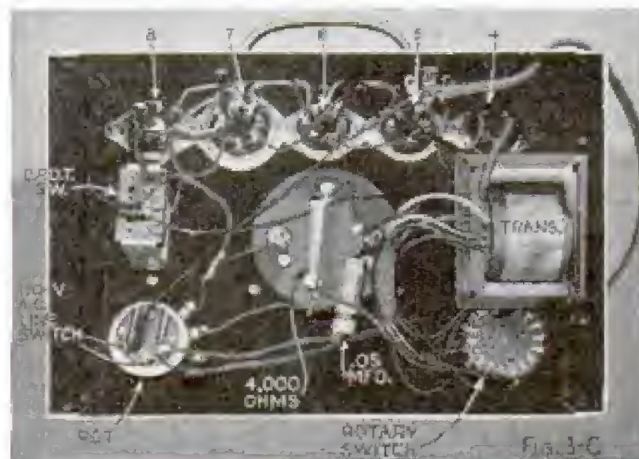
Address.....

How to Build a Tube Tester

(Continued from page 259)

octal base tubes. A top view of the completed unit appears in photo Fig. 3-A and a close-up of the meter in Fig. 3-B.

Ordinary hook-up wire with push-back insulation is used for all connections. The double-pole, double-throw switch is an anti-capacity type, and the rotary switch is a non-shorting variety which must have at least ten taps. A 1,000-ohm wire-wound potentiometer is used, with a snap-on switch fastened to the back. The tube-testing transformer has a 115-volt primary and all color-coded secondary leads must be for the voltages specified, at 2 amp. each. The optional fixed resistor, shown in dotted lines, may be any value from 100,000 to



250,000 ohms, ½ watt, and is connected across the neon bulb socket if the bulb should continue to show a pale light on practically all tests for "shorts." A material list of the original parts used and additional tube-chart data can be obtained from Popular Mechanics radio department without charge. The blueprint number is R-264.

A bottom view of the completed unit is shown in Fig. 3-C and a close-up of the rotary switch connections appears in photo Fig. 3-D. These soldered connections should all be made before the transformer is mounted on the inside of the case. To test tubes, first refer to the chart for the proper settings indicated for the type of tube under test. Now, before placing the tube in a socket, adjust the rotary switch to the filament switch tap number and turn the potentiometer to the load setting indicated for that tube. Insert the tube in the socket, place cap on tube, if required, and

(Continued to page 138A)

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Only \$6.85

(Continued from page 136A)

throw the d.p.d.t. switch to "test." For heater-type tubes allow a minute for the tube to heat up; the meter will then indicate the condition of the tube. Now push the d.p.d.t. switch back and watch the neon bulb. No light, or a quick flash, indicates a good tube; while a continuous light tells of a short or leakage in cathode-type tubes. However, there are a few exceptions to this rule in the case of the following tubes: types 5T4, 5U4, 5V4, 5W4, 5Y3, 5Z4 and 6A5. These tubes will test shorted but are



FIG. 3-D

not defective. Four-prong tubes will show no "short" test; all G-type "glass-bulb" tubes take the same chart test as the metal varieties of the same type. This compact and easily portable unit has been designed carefully to meet the needs of the set owner, experimenter and serviceman of limited means who likes to assemble his own testing equipment. With several receivers in nearly every home, all using different types of tubes, every set owner should have some means of locating a defective tube quickly.

All tube-testing devices only indicate the difference between a given tube's characteristics and those which are standard for that particular type. Since the actual operating conditions imposed upon a tube of given type may vary within wide limits in certain applications, no tube tester can be considered a final authority in all cases, but it is a most helpful device for indicating the serviceability of a tube.

New Tilting Arbor Saw

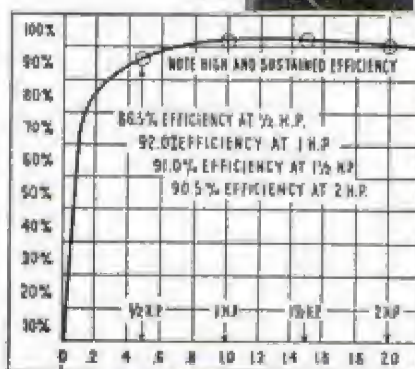
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● Everywhere, men who use it, say this new Delta tool is the finest Tilting Arbor Saw on the market. Perfected after seven years of patient testing and experimenting—the new Delta Tilting Arbor Saw is the ideal circular saw for small shops, home workshops, schools, contractors, shipping and maintenance departments, woodworking plants—in fact wherever a compact low-price, efficient circular saw is needed. Some of its outstanding points are: Powerful fully enclosed motor; highly efficient "Tex-Rope" drive; perfected raising, lowering and tilting mechanism; new scientifically designed rigid housing; patented double-face, double-lock rip gauge; exclusive precision auto-set miter gauge; patented ripping extensions; sealed-for-life ball bearings; forged alloy-steel arbor; extra large table; "Point-of-use" controls and numerous other features. The full story of this new Delta tool and the complete 1939 line of Delta tools is found in the latest Delta Catalog. Send coupon for your FREE copy today.

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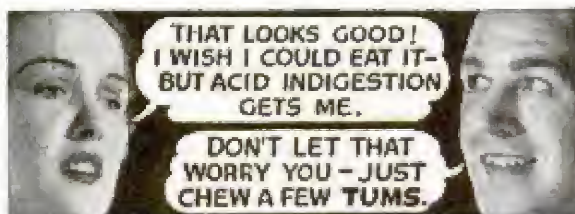
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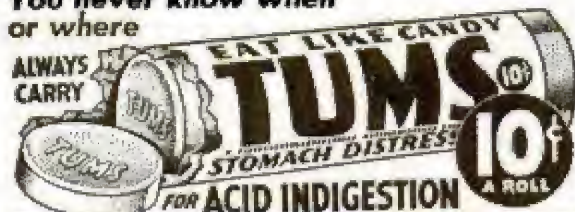
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When writing to advertisers please mention Popular Mechanics

Super-Safety Goes to Sea

(Continued from page 235)

ship by means of a small handwheel, or the large wooden steering wheel that stands alongside the automatic device. Still another emergency steering gear is located in the steering engine room above the rudder head in the stern of the ship. This station is provided with a compass and with a telegraph to the bridge so that steering orders can be transmitted without delay. As part of the campaign of safety, the words "port" and "starboard" no longer apply in steering directions. "Right rudder"



Officer closing hydraulically operated watertight door in engine-room compartment

der" and "left rudder," meaning to turn the wheel, and thus head the ship to the right or left, are used instead.

Big liners carry a fortune in emergency lifesaving gear that may never be used during the life of the ship but that must be ready for use at a moment's notice. The chief item in this equipment, of course, is the lifeboats and rafts. On large ships at least one of the lifeboats must be equipped with an engine, enough fuel for twenty-four hours operation, a searchlight, and a radio set, together with a power supply

(Continued to page 142A)

"MATCHED PAIR" FOR THE MAN WHO SAYS,

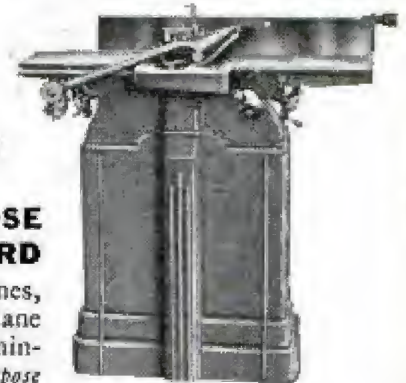
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(Continued from page 141A)

sufficient for six hours of operation. All lifeboats are equipped with boat hooks, buckets, a compass, self-igniting red distress flares, drinking cups, flashlights, hatchets, life preservers, lanterns, life lines, matches, oars, water and provisions, and a sea anchor with a bag of storm oil. Lifeboats without motors carry a mast and sail.

Manufacturers of lifeboats have to furnish construction drawings by which the strength and seaworthiness of their boats can be determined. Davits and lowering gear must pass exhaustive tests before they may be installed. Steel lines instead of rope are used for lowering lifeboats to the water, and steel chain ladders are used for climbing down to boats on the water. Most liners employ a gravity type of davit by means of which one man is able to release a boat and lower it slowly. Repairs that are made to a lifeboat or to a davit must be reported, so that the strength of the change can be tested.

Among the fire-fighting apparatus required by law on ships are steam-smothering lines leading into the holds, double-acting steam fire pumps with suitable hydrant connections, carbon-dioxide systems as well as portable hand extinguishers for fighting different kinds of fires and overhead water-sprinkling systems in sleeping compartments, galleys, and freight spaces. Some of the large transatlantic liners have a central fire station on board where firemen keep watch twenty-four hours a day over the smoke pipe and other fire-alarm systems.

Safety at sea really begins long before a new ship is built. Sturdier bulkheads are required to make them less sinkable and they are designed with the idea of maintaining a good balance in the water even if they have been damaged seriously. Hundreds of tests under government supervision are made of steels and metals at the factories, and inspectors watch each stage of construction. Safety specifications covering many parts of the ship not previously considered have been drawn up. Even the chemical composition of bronze castings, the tensile properties of different rivets and the composition of steel plates are covered by law. Radiograph pictures are taken of boiler welds to make certain of their strength.

(Continued to page 144A)



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PUTS THIS OTTAWA to work for you. MAKE MONEY! Wood is valuable. Does more than 10 men. Easily operated. Falls trees—saves limbs. Use 4-hp. engine for other work. Write for **FREE BOOK**.
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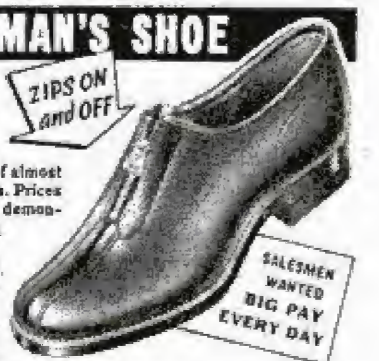
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FREE Accessory outfit (Value \$29 includes set of drills, mounted 1 1/2 inch grinder, sanding discs, cutting wheels, mounted brush, polishing wheel, carrier bar, etc. **FREE** with each outfit ordered NOW. We pay postage. Will send C. O. D. if desired. **10-DAY TRIAL—MONEY BACK GUARANTEE.**

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E. C. ATKINS AND COMPANY
426 South Illinois Street
Indianapolis, Indiana



141203

(Continued from page 142A)

Then, throughout a ship's life from the time it is launched until it is withdrawn from service, it undergoes frequent inspections. An annual inspection is held at which members of the steamboat inspection service peer into boilers, examine the fire-fighting apparatus, and test all the machinery. Tail shafts are inspected at three-year intervals and special surveys may be made at four-year intervals. For these the ship must be drydocked so that the inspectors can examine the hull and rudder. Pistons and cylinders of the main and auxiliary engines are inspected and parts that are worn to certain limits have to be replaced before the ship can go to sea again. Special attention is paid to the electrical and emergency lighting systems, the telephone and engine room telegraph systems, and the condition of alarm bells. A ship at sea must be prepared to meet any emergency.

H 17 3

What Your Nose Knows

(Continued from page 219)

the sense of taste, the stimulating material is in the mouth and we locate it there. Again, in smell the stimulating material is likewise in the cavity harboring the sense organ, but we do not think of it as being there. We project it into the exterior, to the object from which the odorous particles came. In this respect smell is like sight. Finally, there are only four taste qualities—salt, sweet, sour, bitter, and possibly two others, alkaline and metallic—whereas, there is no known limit to the number of odors which can be appreciated by the sense of smell."

Our smelling equipment lies in the upper region of the nasal cavity. No larger than a dime, it looks like a brownish-yellow patch and over this area are distributed the fibers of the olfactory nerve. Leaving this membrane the nerves unite into trunk lines, making their way upward to the olfactory lobe in the brain, where the impulses are interpreted into perceptions and stored in the memory.

The average person can note the odor of camphor when it is diluted in proportion of one to 400,000 and with those having a highly developed sense of smell, the detection of a millionth of a milligram of the vapors of many organic substances is possi-



DOENUT WHEELS

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ble. In some instances, however, the human nose's performance is overshadowed by the olfactory organs of science. Proof of this is furnished in their detection of insidious carbon monoxide. Here is a deadly gas: odorless, colorless, tasteless, and non-irritating. The human nose is powerless in its presence but the laboratory-made instruments can discover as little as two and one-half parts of the toxic fumes in 100,000 parts of air.



Smelling sample of grain to detect odor of weevil, smut or other defects

Not only does a sense of smell help an animal to ferret out its food but also aids him in detecting enemies and friends.

One researcher discovered each ant hill has a separate odor and if the inhabitants of one are placed into another they will be destroyed immediately. If, however, the home crew is deprived of its smelling equipment the visitors will be unharmed.

With the exception of the greyhound, all dogs are nose animals. They smell everything with which they come in contact, and their actions show they will not accept anyone until he has passed the nose test.

Popular Mechanics Magazine can furnish the name and address of the maker of, or dealer in, any article described in its pages. If you wish this information, write to the Bureau of Information, inclosing a stamped, self-addressed envelope.



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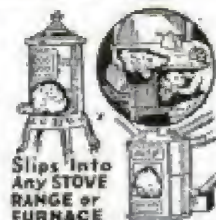
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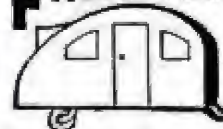
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Davy Jones' Treasure Chest

(Continued from page 191)

amounts of material having fallen off one wall. Currents of water flow along the canyons, some at speeds of half a knot, and the currents reverse themselves every few hours. Currents in the canyons are measured with a device that consists of fan blades like those of an anemometer, a counter, vanes to keep the current meter pointed in the right direction, and a registering compass that records the direction the meter points.

There are a dozen or more volcanic mountains submerged off the California coast. Recently Dr. Shepard confirmed the



Oil well half a mile at sea in the open Pacific off the coast of California

volcanic nature of a large mountain about 150 miles off Santa Barbara. Known as San Juan mountain, the submerged peak rises 10,000 feet above its surroundings. In mass and area covered, it compares quite closely with Mt. Shasta. It has a typical crater-like depression in its summit and Dr. Shepard dredged samples of hard, basaltic lava from its slopes. There is no way of telling whether San Juan mountain still erupts intermittently although there is evidence that it has been active in historic times. Other large volcanoes have been charted off the entrance of the Golden Gate and eighty miles southwest of Carmel.

(Continued to page 148A)

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(Continued from page 147A)

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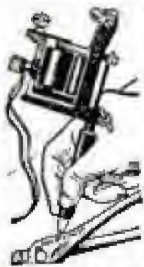


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Few people have ever visited the sub-sea regions except investigators who descend in diving machines or bathyspheres. Exploration must be conducted from the decks of ships. The most valuable tool of the explorers is the fathometer. This instrument measures the depth of the water by counting the seconds required for a sound wave starting at the surface to bounce back after it hits bottom. For accurate measuring of such features as canyon walls the lead line is still used, since the fathometer measures the distance from the surface to the nearest ground instead of the vertical distance under the ship to the bottom.

A "snapper," an instrument with clam-shell jaws that automatically bite into the sediment the instant they touch, is lowered to the bottom when small samples are desired. A deep-sea dredge consisting of a round steel tub or crate made of steel slats with an open end, is dragged along the bottom for gathering specimens of rock. An ingenious device also has been developed for taking cores as deep as eleven feet below the surface. The coring tube, with a 640-pound streamlined weight, is dropped to the bottom at a speed of fifteen miles per hour, plunging into the sediment and automatically closing.

Rocks and mud are not the only things the dredges and samplers bring up. Bones of prehistoric animals, porous chunks of manganese, bones from the ears of whales, old oar locks, metal buttons, waterlogged wood and fossil shells are some of the things retrieved. Working in shallow depths of less than 400 feet, the dredges bring up quantities of sponges, beautiful deep-sea ferns, fans, and bushes, as well as strange kinds of starfish and sea urchins.

It will be a long time before the explorers learn all they would like to know about the bottom of the sea. "If you should make a few flights across the United States in an airship after dark, dropping a line now and then to snag samples of the rock and dirt, you would hardly expect to obtain a very complete knowledge of the surface," Dr. Shepard remarks. "That, essentially, is what we are doing in exploring the sea bottom. In spite of this handicap we are obtaining a pretty good picture of what the submarine terrain and geology are like."

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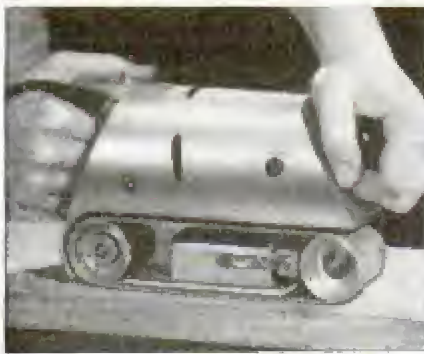
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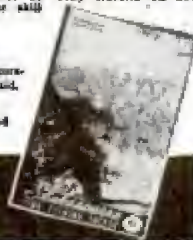
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Riding the Iron Cavalry

(Continued from page 163)

of Caterpillar treads, the barks of exhausts and the trek begins. From above comes the drone of three observation planes—the brigade's eyes on the road and in battle. In operating the combat car, you sit well forward and peer out a small slot while steering by means of two sticks, one in either hand for each track. Handle them lightly or you'll land in a ditch. On the road, the need for a crash helmet may not be as apparent as in maneuvers over rough terrain when the "tank" takes an occasional dive into a gully.

Mile after mile you move with speed and precision. From the air-corps squadron, the commanding officer learns of any breakdowns by radio or message. Before dropping the latter, the air crew places it in a weighted sack to which is affixed an orange streamer about six feet long. Then, dipping low, the plane drops it near the command scout car where a soldier on a motorcycle picks it up with a stick, transferring it to the commander in the same manner. He in turn can relay orders to the troop officer over the command network.

During a day's run the line may be strung out over thirty-five miles and several plans are used to close up gaps. For instance, you may receive a general order that at ten o'clock the brigade is going to make a twenty-minute stop and "all units will close to normal distances." Headquarters uses a check system to keep informed on the condition of the column. Check points such as bridges or landmarks are determined in advance. As each group passes this point, word is sent to the command car by radio. Reports from all units are graphed on coordinate paper and by checking with the speed at which the line is moving, the commanding officer can tell where the gaps are. If an armored, scout or combat car breaks down, it will be picked up by the ordnance company bringing up the column rear, but if the crippled vehicle is a truck, station wagon, motorcycle or passenger car, the towing facilities of the quartermaster corps are used.

Seventy-five two-way radios are scattered throughout the brigade. Tubes fitted with snubbers to withstand shock are in the radio sets, said to be 300 times more

(Continued to page 153A)

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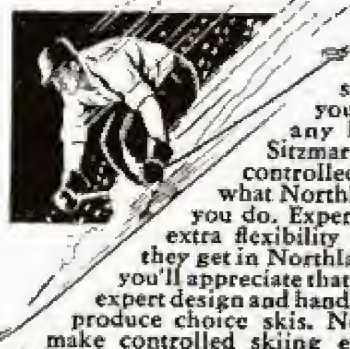
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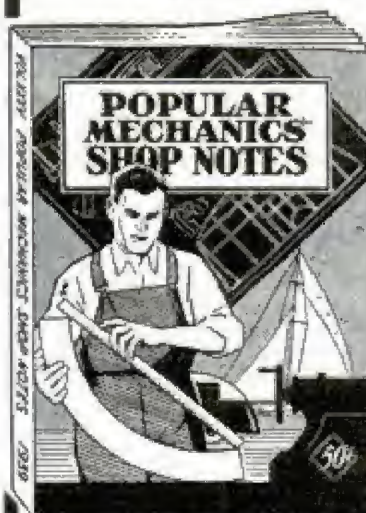
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(Continued from page 150A)

sensitive than the average car radio. Three command cars are the focal points for all the communications going out over the different networks set up within the brigade. A phonetic style is used in giving call letters. Brigade Station Q. M. No. 8 on the air is, "Queen-Mike-Eight" or Plane EC5 is "Easy-Cost-Five."

Coded messages are not used very extensively. Even in engagements, communications are sent in the clear when the information is not of particular benefit to hostile forces or when the action is to be executed before the enemy can take advantage of the information.

Grimy from exhaust fumes and hours of dust eating, you climb out of the combat car and slip into fatigue clothes as soon as the iron cavalry stops for the night. In the traditional manner of a cavalryman who provides for his horse's comfort first, you start cleaning and checking the tank with the other members of the crew. Naturally, maintenance is the lifeblood of the mobile force. As a precaution against road delays, rigid daily inspection of machines is held.

If you are a car commander, you have a trip ticket you must fill out and submit at the end of the run. On this tally you make a record of fuel, oil, lights and batteries. Additional spaces are provided to mark down trouble. Minor repairs you do yourself but where the job is more complex the troop's repair crew get a call. If they are not equipped to handle it, the job is turned over to regimental maintenance.

Welding outfits, lathes, milling machines, power saws and electric drills are a part of the three portable shops of the ordnance corps. There is a portable light plant, too, so repair crews may work after dark. The towing trucks can lift nine-ton combat cars without difficulty. More than fifty tons of spare parts are taken along on cross-country trips. The maintenance men are top-notch mechanics, having been put through a technical course by the army.

But don't get the idea the mechanized cavalry is going to supplant the horse troops. According to Lieut. Col. John F. Davis, training officer of the brigade, the horse troops and the iron cavalry augment and supplement one another. "Each has its own sphere of action," he explains. "The job of the iron cavalry in a battle would be

(Continued to page 154A)

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(Continued from page 153A)

to strike a quick, hard blow and get away fast. In a pinch, we might even take and hold a position and defend it against enemy counterattacks. In proportion to its size, our brigade has a power of fire excelling any other branch of the army."

For certain types of reconnaissance, it is pointed out, the horse troops are unsurpassed, and will never have to take a back seat to airplanes or machines of any kind.

No matter what the fashions in war may be, the iron-horse troops and the regular-horse troops, according to Major General John K. Herr, chief of cavalry, can be counted on to form a strong, hard hitting, independent combat force.

Taming Death Valley

(Continued from page 171)

This lack of moisture leads the desert vegetation to unusual ways of collecting and retaining water. Some shrubs keep alive by shedding their leaves; others have no leaves, and in some species the leaves are reduced to scales. Some of the cacti have shallow, pulpy root systems that greedily absorb water during a rain for use in the long dry months. Most desert shrubs have extremely long roots, a twenty-six-inch salt bush, for instance, having roots that extend downward as much as twenty feet. Wild life is abundant, ranging from big-horn mountain sheep in the high ranges to coyotes, lizards, side-winder rattlesnakes, kit foxes and birds. Even tiny fish are found in some of the salty pools.

Since it was first discovered the valley area has been shunned by all except the native Shoshone Indians and hopeful prospectors. Even the Indians move into the near-by mountains during the summer. The prospectors who first went into the region followed Indian trails, chipping at likely looking ledges on the way. Some made fortunes while others, after finding rich veins, became so confused on their parched journeys back to civilization that they were unable to relocate their finds. Many so-called lost mines are in the region and some are still sought today.

No one has ever found the "Lost Gunsight" since its original discoverer broke large chunks of almost pure silver from a deposit in the Panamint adjacent to Death

(Continued to page 156A)

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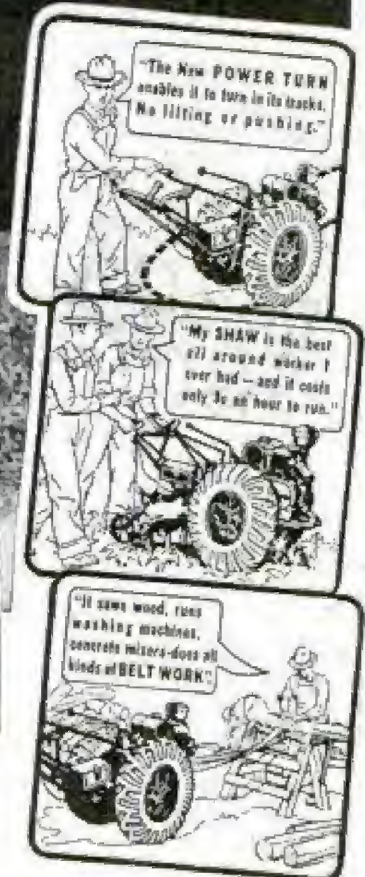


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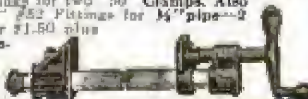
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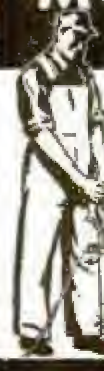
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(Continued from page 154A)

Valley. The discoverer still had the specimens in his pocket when he stumbled into a desert town after a heartbreaking journey across the hills, but he could not locate the spot after he had recovered his health.

Most mining men today think the famous "Lost Breyfogle" for which hundreds raked the hills east of Death Valley late in the last century has since been found and worked to depletion by a group of miners who did not realize they had re-discovered the famous vein. At least, specimens of ore from a rich but small deposit of gold



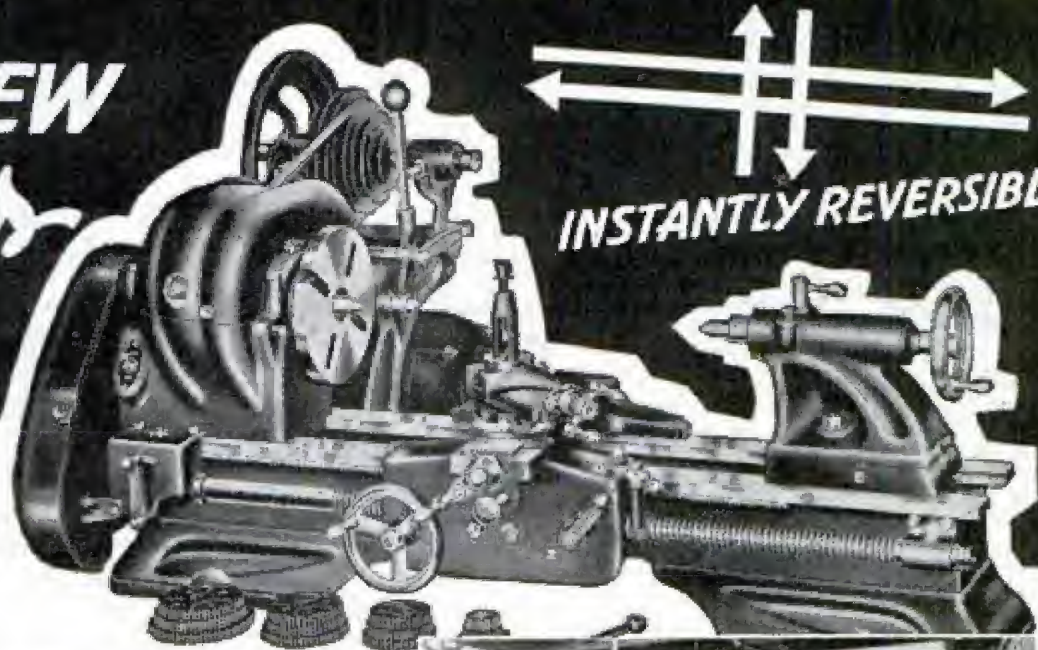
Mountain view across Death Valley, which is 140 miles long and four to sixteen miles wide

in a canyon overlooking Death Valley proved to be identical with the specimens thirst-tormented James Breyfogle had in his pocket when he was rescued from the desert in 1863. The most famous lost mine of all, the "Lost Peg-Leg," some mining men believe, was re-discovered by Pete Aguerreberry in 1905 in the Panamints a mile above Death Valley. The "Lost Peg-Leg" has claimed the lives of many searchers since 1853, mostly in the Colorado desert 100 miles south of Death Valley. The twin or triple buttes on which Peg-Leg Smith made his rich discovery have never been located in that area, but Aguerreberry's find, of similar rich ore, was made

(Continued to page 159A)

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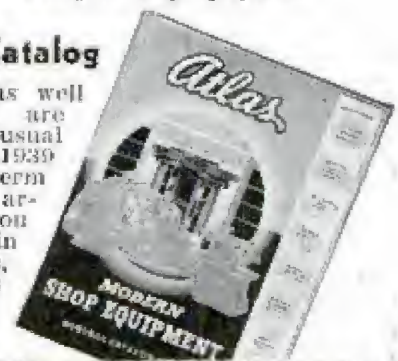
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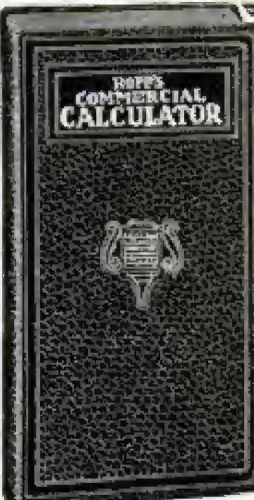


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(Continued from page 156A)

on a triple butte in an upland valley of the Panamints. Aguerreberry is still working his mine, using modern trucks instead of the burros with which he originally prospected the area.

The abandoned ghost towns of the desert are disappearing now that new settlements are being built, lumber being so scarce on the desert that old buildings have been torn down and carted away by those who needed them. On the map, for example, the town of Harrisburg is located near Aguerreberry's mine, yet all that remains of that rich gold camp today are a few heaps of rusty machinery.

There are dozens of small gold mines scattered through the desert hills and employing from one to a score of miners, still yielding steadily on a small scale. Much of the wealth of the Panamints, many of the miners think, remains to be discovered.

The real treasures of the desert, while not yielding such spectacular get-rich-quick results as gold, are the great deposits of non-metallic minerals. Tremendous deposits of borax, rare in other parts of the world, are found in many of the ancient lake beds of the region and the refined products are shipped to all parts of the world. Thousands of tons of potash also are mined.

Off the beaten paths, Death Valley and the surrounding desert stretches are still as desolate as ever. Enameled signs at the points where dirt roads lead off the highways carry warnings that the routes should not be attempted without adequate provisions of water, fuel and oil. Mileage signs give the distance to the nearest water hole and occasionally a traveler finds a posted warning: "Poison Water."

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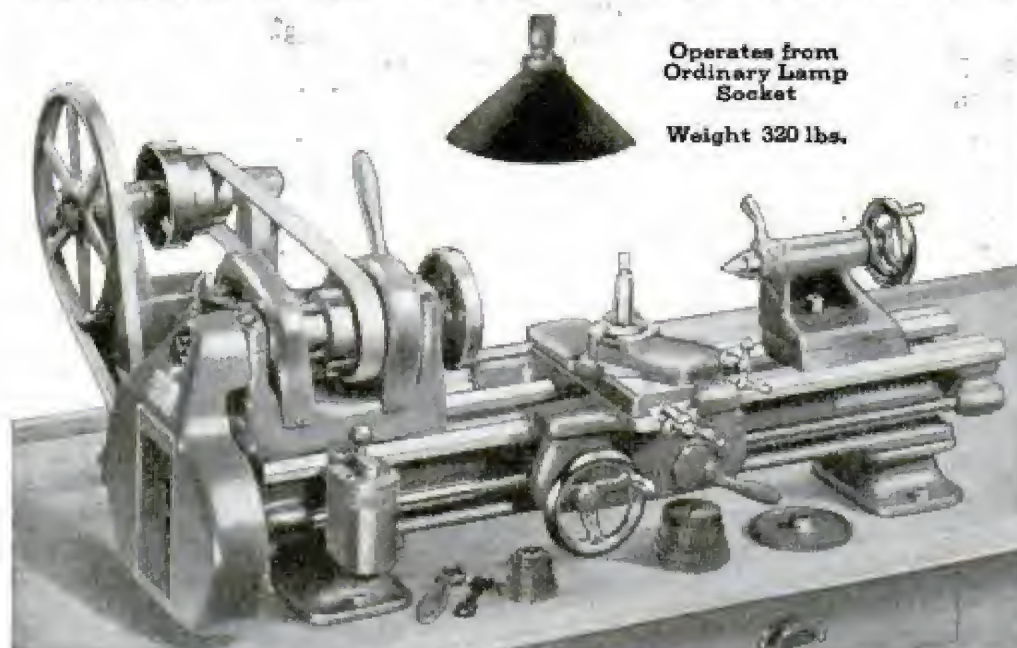


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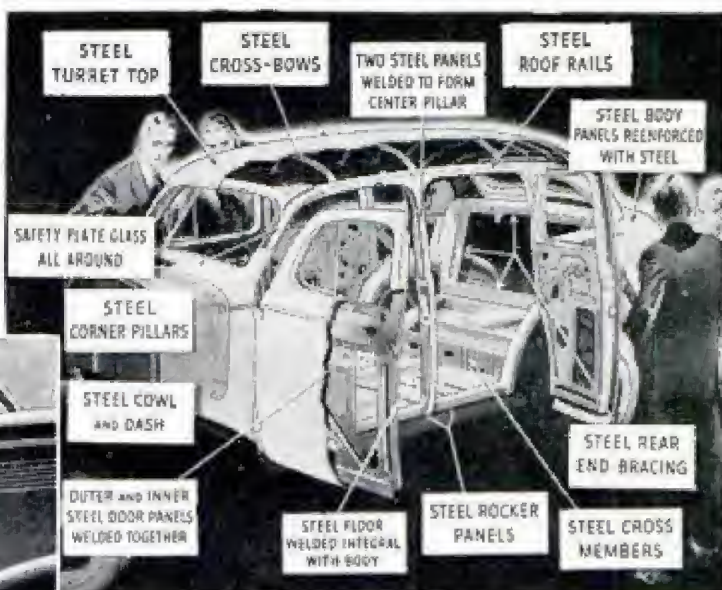
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